Economic evaluation of management of Diabetes and Asthma: A study of selected patients in Bangladesh.

MPhil Thesis

Submitted by
Humaira Habib Samira
Roll No: IIHE 01
Exam Roll No: 01
MPhil (Health Economics)
Institute of Health Economics
Session: 1999-2000
Date: April, 2008

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The Thesis is submitted in Partial Fulfillment of the Requirement for the Degree of Master of Philosophy in Health Economics

Dedicated

To the millions of Diabetic patients &

Asthma patients

For whom my research is targeted

Certified that **Samira Humaira Habib** has completed her thesis entitled "**Economic Evaluation of Management of Diabetes and Asthma: A study of selected patients in Bangladesh**" at the Institute of Health Economics under my guidance.

Her work is genuine and up to my full satisfaction.

Prof Sushil Ranjan Howlader, PhD
Professor and Supervisor
Institute of Health Economics
University of Dhaka
26 Feb, 2008

Certified that **Samira Humaira Habib** has completed her thesis entitled "**Economic evaluation of management of Diabetes and Asthma: A study of selected patients in Bangladesh.**" at the Institute of Health Economics under my guidance.

Her work is genuine and up to my full satisfaction.

Prof Liaquat Ali, MBBS, Mphil,PhD
Executive Advisor
Health Economics Unit
Diabetic Association of Bangladesh

I hereby humbly declare that this thesis entitled "**Economic evaluation of management of Diabetes and Asthma: A study of selected patients in Bangladesh.**" is based on work carried out by me and no part of it has been presented previously for any higher degree.

The research work was carried out under the guidance of honorable **Prof Sushil Ranjan Howlader,** Professor and Supervisor, Institute of Health Economics, University of Dhaka & **Prof Liaquat Ali,** Executive Advisor & Supervisor, Health Economics Unit, Diabetic Association of Bangladesh.

25.02.08

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Institute of Health Economics

ACKNOWLEDGEMENT

Almighty Allah, the Beneficent, the Merciful, for creating and sustaining myself in the beautiful world.

Prof Sushil Ranjan Howlader, my supervisor for his contribution in developing the Health Economics in this country and for his valuable guidance, intellectual inputs, constructive criticism, ever-smiling cooperation and sincere effort to materialize from the beginning to end of the study

Prof Liaquat Ali, my Professor, for well designed guidance, constructive criticism, intellectual input and opening to me the door of wonderful field of Health Economics.

Prof Azizur Rahman, Dr Azahar Ali Mollah, Mr Syed Abdul Hamid, Mrs Nahid Akther Jhahan, Dr Hosne Ara the teachers of the Institute for expanding my knowledge in the academic field of Health Economics.

Diabetic Association of Bangladesh & BIRDEM, for its financial support and to develop Health Economics in BIRDEM and to my academic career.

Kazal Boron Biswas and Salima Akter for their valuable advice and sincere help regarding Statistical analysis and graphical presentation.

All my classmates, friends and colleagues for creating a nice and friendly research and working Environment.

Shamim, my husband for active support in scientific writings and sacrifice during my absence from the family and for sharing pain and pleasure through a lovely companionship.

And, finally, my sons **Autal** and **Auddhaya** for depriving them from their motherly affection and touch during my absence from them.

(Samira Humaira Habib)

Student

Economic evaluation of management of Diabetes and Asthma: A study of selected patients in Bangladesh.

Abstract

Introduction: Among the non communicable diseases the most prevalence one is diabetes and then asthma. Diabetes has profound effects on individuals and their families. The condition accounts for a large and growing cost to the health care system. If diabetes is not well monitored and managed, sustained high blood glucose levels, sustained high blood pressure and abnormalities of lipid metabolism cause damage to small and large blood vessels throughout the body, leading to long-term complications. Diabetes is a common problem in Bangladesh as it is worldwide. Cost of care is comparatively low but benefit in terms of cost/ cost benefit is at a higher rate in case of diabetes. And it would be worthwhile when the investment will be made high here. Asthma is a very common chronic disease that occurs in all age groups and is the focus of various clinical and public health interventions. Both morbidity and mortality from asthma are significant. The economic cost of asthma is much more higher both in terms of direct medical costs and indirect medical costs. The burden of asthma and its socioeconomic implications and proposes a model to predict the costs incurred by the disease. As such health status with chronic disease of course adversely affects the over all GDP, employment, revenue and other variables as well. To eliminate those diseases and for reduction of the cost burden of these two chronic diseases there should be investment in that area where the cost in terms of benefit is much more higher in returns. Prevalence and economic burden of DM and Asthma and relative return of investment for the elimination or the reduction of the burden of these two chronic disease is much more important regarding its cost burden. The main objective of the study is to observe the total burden (economic and non-economic) is higher and management is more cost-effective for diabetes than that for asthma. **Hypothesis:** The underlying hypothesis is that the total burden (economic and non-economic) is higher and management is more cost-effective for diabetes than that for

asthma. **Methodology:** Cross sectional study that would be analytical and retrospective in nature. The samples would be in two groups. Primary and secondary data would be collected from patients who were undergoing treatment for diabetic at the Out Patient Department of BIRDEM, and NHN, Dhaka & Asthma patient from The Asthma Centre. A total of 200 patients would be selected purposively. Of them 100 would be patients with type 2 diabetes and 100 would be Asthma patients The main variables are degree and extent of complications, treatment outcome, clinical effectiveness, functional level, consumers out of pocket expense, indirect cost of consumer, disease burden, economic cost. Data analysis procedure would be managed by the appropriate statistical technique. Disease burden would be calculated through DALY method, Cost would be calculated considering all the inputs as well as opportunity cost forgone. Among the cost components direct and indirect cost would be calculated for total patients. The total cost for both the groups was to be found for the cost effectiveness ratio. EQol would be calculated through appropriate formula. **Results:** The demographic distribution showed that the disease prevalence is much more higher at urban area rather than sub-urban and rural area because life style modification, rapid urbanization and modified dietary habit increase the prevalence of the diseases. One interesting findings is that in both cases the urban people are suffering more. Family history of diabetes was present in only 15% Cases and of large sample. Serum glucose level of ≥ 14.0 mmol/dL has been shown with 20% of men and 22% of women. On the contrary it has been shown that only 17% of the study subjects has been suffering from severe asthma, 30% of moderate asthma and 53% of mild asthma. So it is obvious that the burden is much more higher in case of diabetes than that of asthma. Oral hypertensive & hypoglycemic medications (both) were taken by 50% of women and 22% of men. Only 9 (15%) of subjects reported a family history of Diabetic hypertensive, while 27 (45%) of hypertension with high blood pressure. Of those subjects known to be hypertensive patients with type 2 diabetes 15 (25%) had a serum glucose level of ≥ 14.0 mmol/dL. There must be a cost burden due to complications and it has been shown that it is much more higher in case of diabetes rather than asthma. Among the diabetes patients 58.33% was suffering from nephropathy complication, 23.33% of retinopathy, 16.66% of neuropathy. On the other hand among the asthma patients only 11% is suffering from

Bronchiolitis, 13% mold allergies and 16% Whooping cough. Cost analysis in 100 diabetes patients & 100 asthma patients showed that the total cost of treatment was US$ 17300.22 (direct cost US$ 10341.44 and indirect cost US$ 6958.78) with an average of US$ 173.00 per patient in case of asthma. On the other hand in case of diabetes the corresponding values were US $ 13308.28, 9159.49 and 22467.77 with an average 224.67. In direct cost we can find that the investigation and medical treatment constitute most of the cost both in asthma and diabetes. In case of drug, to treated diabetes it cost much more higher than in case of asthma. The corresponding values were 957.66 US$ and 1954.53 US$ which was almost double. The incremental cost of intensive management of diabetes was US$ 101.54 (US$ 218.54 to US$ 117.00) per patient and event-free time gained in this group was 0.55 (0.18 to 0.92) years and the life years gain 1.19 (0.79 to 1.81) years. The incremental cost per event-free year gained was US$ 198.12 (costs and effects discounted at 6% a year) and US$ 201.34 (costs discounted at 6% a year and effects not discounted) in case of asthma. The incremental cost of intensive management of asthma was US$ 89.54 (US$ 314.21 to US$ 224.67) per patient and event-free time gained in this group was 0.68 (0.21 to 0.89) years and the life year gain 1.12 (0.49 to 1.61) years. The incremental cost per event-free year gained was US$ 223.34 (costs and effects discounted at 6% a year) and US$ 234.25 (costs discounted at 6% a year and effects not discounted). The main factors related to the perception of a health condition and a health status improvement (HSI) in the EuroQoL were morbidity 3.79 pain/ discomfort 3.34, anxiety/ depression 4.56, dependence for basic everyday living activities (usual activities) 4.19 and self care 2.78 for both the disease. The total for the asthma the health condition and a health status improvement (HSI) in the EuroQoL was 69.35 (per patient 2.41) where as for the diabetes the health condition and a health status improvement (HSI) in the EuroQoL is 136.39 (per patient 4.54). The EuroQoL difference between the diseases was to be found 64.04. The cost-effective ratio is found to be (US$ 224.67/ 136.39) US$ 1.64 cost per effect in case of diabetes. The cost effectiveness ratio was (US$ 117.66/ 69.35) US$ 1.69 cost per effect in case of asthma. A total of 100 DM patients and Asthma 100 patients were considered for an average of 365 days, totaling 651 person-yrs of observation. The total number of admissions generated 130 bed-days (17 individuals with diabetes) and 61 bed-days (9 individuals with asthma) total

costs of US $ 188 (US $ 143.4 for individuals with diabetes and the rest for asthma). The mean cost per admission was US $ 8.43 for individuals with diabetes and US $ 4.95 for asthma. The rate of admissions during the study year was 17 per 1,00 individuals with diabetes compared with 9 admissions per 1,00 for individuals with asthma. Some of the clinical findings also found as interesting to support the hypothesis. The mean (± SD) age between the groups were 53.6±8.8 & 55.0±9.1 yrs, systolic blood pressure was found 152.5 ± 20.9 mmHg & 123.5±11.9 mmHg, diastolic 97.7±10.0 & 78.7±9.3 mmHg, total cholesterol 195.5±41.6 & 109.2±34.5 mg/dl, HDL cholesterol 50.2±20.3 & 39.1±15.1 mg/dl, HbA_{1c} 7.1±1.5% & 4.9±1.9%, and Hb level 11.9±1.3 & 13.9±1.5 g/dl in case of asthma and diabetes respectively. Nineteen patients were free of Asthma -related & complication comorbidities & 36 in Diabetes patients. In Asthma group, 32 patients had one complication and 29 had two & 20 had more than two complications & in diabetes group it was 48, 10 & 6 respectively. While in hospitalization, 52% (US$ 14360.48) of costs were attributable to drugs for these patients of both the diseases who have complications of which US$ 10419.39 was for asthma patients. 28% (US$ 7732.56%) to hospitalizations of which US$ 4913.72 was for Asthma. 11% (US $3037.79%) to diagnostics & US$ 1953.22 for Asthma and 9% (US$ 2485.46) to visits & US$ 1631.42 for Asthma. So the result showed that the initial cost is much more higher in case of diabetes than that of Asthma, but when goes for management of these two diseases then we could find that complication become less in case of diabetes. And management showed that when the diabetes could mange properly and care become fruitful then its much more cost-effective than that of Asthma. The annual medical costs increased with the number of complications from US$ 1,320 to US$ 2,296 & to US$ 3,989 in Asthma with one, two & more than two complications which was increasing at a rapid speed and US$ 917 to US$ 1556 & to US$ 2372 in diabetes patients respectively, increasing at a diminishing marginal rate. The association showed statistically significant in both univariate ($P < 0.0001$) and multiple linear regression analyses ($R^2 = 0.51$; F-82.5, $P < 0.0001$). The number and causes of working days lost during the calendar year were determined for each individual. For temporary disability, average days per year lost in asthma patients without complications did not differ significantly from the number for the age- and sex-matched control group

($p< 0.01$). However, diabetic patients with chronic complications had a considerably higher rate ($p < 0.06$) of days lost than the control group or patients with diabetes without complications. The costs of permanent disability for patients were estimated by calculating the expected number of years to retirement age for each early retiree. Work production loss was discounted at a 6 % rate (WHO Criteria). Average work production lost for 15 patients disabled by diabetes was 11 years (n = 15; 8 women, 7 men) and 9 patients disabled by diabetes was 5.8 years. At an annual cost of US $ 32,6,10 (U.S. dollars) for Asthma and the total cost for the diabetes was US $27,20,9 calculated due to DALY. So economic evaluation of management showed that Diabetes is much more cost effective when it treated properly than that of Asthma. **Conclusion:** The patients with type 2 diabetes significantly increased treatment costs but substantially reduced the cost of complications and increased the event-free days but the rate is not diminishing marginal rate, it's an increasing rate. On the other hand the patients with acute asthma does not significantly increased the treatment costs and as well as the cost of complications and increased the event-free days, also the rate of increase is the diminishing marginal rate, its not a increasing rate at all like the diabetes one. Timely management of patients with diabetes is both clinically astute and cost effective. It can increase survival and the interval without complications, and the cost effectiveness ratio will be able to compare favorably with many accepted healthcare programmes.

CONTENTS

	Page No
1. Introduction	1
2. Burden of diabetes and asthma: Review of literature	**14**
2.1 Introduction	14
2.2 Burden of Chronic Disease	14
2.3 Costs of Chronic Disease	17
2.4 Cost-Effectiveness of Prevention	17
2.5 Burden of disease by major disease groups	19
2.6 Burden of non-communicable diseases in South Asia	22
2.7 Burden of Diabetes	25
2.7.1 Burden of Diabetes in Bangladesh	26
2.8 Burden of Asthma	28
2.8.1 Burden of Asthma in Bangladesh	31
2.9 Bangladesh Scenario	34
3. Methodology	**39**
3.1 Methods of data Collection	39
3.2 Method of analysis	40
3.2.1 Costs	40
3.2.2 EuroQoL Classification System	41
3.2.3 Disease Burden Estimation	45
4. Results of the empirical study on burden of diabetes and asthma	**53**
4.1 Component wise Distribution:	53
4.2 Cost Distribution	64
4.3 Disease related complications and its trend of cost	68
4.4 Disability calculation	70

5. Summary and Conclusions of the study **71**

5.1 Summary 71

Conclusions 71

Recommendations 71

5.1.1 Developing a strategic plan for diabetes and asthma 72

5.1.2 Strategic planning issues 72

5.1.3 Improving information 73

5.1.4 Implementing 'best practice' 73

5.1.5 Improving service integration across the continuum of care 74

5.1.6 Improving understanding 75

5.1.7 Improving consumer information,
access & participation in decision making 76

5.2 Levels of intervention 76

5.3 Prevention 76

5.3.1 Service providers 77

5.4 Recommendation for management: asthma and diabetes 77

5.4.1 Management: asthma care 78

5.4.2 Management: diabetes care 78

5.5 Limitations of the study 79

6. Bibliography **80**

7. Appendixes **i-xiii**

LIST OF TABLES

		Page No
Table 1:	Distribution of subjects (by Age)	53
Table 2:	Distribution of subjects (by Sex)	54
Table 3:	Distribution of subjects (by Literacy)	55
Table 4:	Distribution of subjects (by Socio-economic class)	57
Table 5:	Distribution of subjects (by Demographic variation)	58
Table 6:	Occupation wise distribution (by Occupational status)	59
Table 7:	Distribution of patients (by Physical Activity Level)	60
Table 8:	Distribution of Level of disease pattern	61
Table 9:	Distribution of subjects (by Complications)	63
Table 10:	Cost components (Direct)	64
Table 11:	Cost components (Indirect)	65
Table 12:	Cost components (Direct, Indirect & Total)	65
Table 13:	Cost components (mean ±sd)	67
Table 14:	EuroQol (mean±sd)	68

LIST OF FIGURES

Page No

Fig 1:	Distribution of subjects (by Age)	54
Fig 2:	Distribution of subjects (by Sex)	55
Fig 3:	Distribution of subjects (by Literacy)	56
Fig 4:	Distribution of subjects (by Socio-economic class)	57
Fig 5:	Distribution of subjects (by Demographic variation)	58
Fig 6:	Distribution of subjects (by Occupation status)	59
Fig 7:	Distribution of patients (by Physical Activity Level)	60
Fig 8:	Distribution of Level of disease pattern (By Complication wise)	61
Fig 9:	Distribution of samples (by Development of complications)	62
Fig 10:	Cost components (Direct, Indirect & Total)	63

INTRODUCTION

1. INTRODUCTION

Bangladesh is a very small and low resource country (1,47,570 sq. km) with the ninth largest population (111.4 million, 1991 Census and 119.96 million estimated/projected in 1996) in the world with 64 zillas (districts), 490 thanas, 4,451 unions and as such the existing Health Care System is inadequate to meet the health care needs of the total population. Therefore, the need and demand amongst the population for non-governmental bodies, is necessary to contribute to the health of the nation. It is assumed that the most correct projection is the official projection based on the actual population count, which looks as follows: Total population is 119,957,000, population density is 755 per square kilometer, gross reproduction rate 1.70, annual growth rate 2.17% and vital statistics show: a crude birth-rate of 25.6 (combined for urban and rural in 1996); a death rate is 8.7 (combined for urban and rural in 1996); an infant mortality rate of 67 (combined for urban and rural in 1996); life expectancy at birth has risen from 58 to 59 for male during the period 1981 to 1996 and same for female during the same period.

The burden of disease profile shows that about fifty percent of the global burden of disease is caused by communicable diseases, while about forty percent are related to non-communicable diseases and about ten percent to injuries. The non-communicable diseases group, excluding injuries, discover that the single cardiovascular diseases group take the first ranking with about 24 percent of the total, followed by nutritional and endocrine diseases and diseases related to neuropsychiatry with each fifteen percent and malignant neoplasm with ten percent. It could be accepted that the public health sector should be more concerned with programs related to the improvement of the health of the population in general and consequently that their priorities go to communicable diseases in the first place: preventive health programs, next to the set up of curative programs which in many cases need the very expensive adequate physical facilities for their implementation.

The private sector however, would, through the nature of the economical objectives of private health care providers, be more geared to the provision of curative health. No private organization could afford to be philanthropic but should at least be able to break even as

far as profit is concerned. In order to do so it seems, and it is logical, that such private organizations would select those activities which are in demand and which corresponds to a market demand that the public sector is or would not be able to offer. So, consequently they would respond to a demand that has a profitable character and which has a potential market volume to optimally use the resources they put at the disposal of their clientele. This does not mean that any private hospital institution could not contribute to the social role of any health care delivery system.

Socioeconomic environment shows: it is pertinent and of special significance to note the societal conditions prevalent in Bangladesh in general, with specific reference to the behavioral pattern and attitude displayed by relations of patients: irrespective of their purchasing capacity and economic status, the relatives go all lengths and pains and efforts to mobilize the cost for diagnostic and therapeutic treatment of near and dear ones since familial relations are priced in the society.

The Existing Health Care Delivery System cover, health care service package, extended Program for Immunization (EPI), essential Health Service Package (EHSP), tuberculosis coverage, mother and Child Health based Family Planning (MCHFP), nutrition.

Among the non-communicable disease the most prevalence one is diabetes and then asthma. The prevalence of Diabetes and Asthma in Bangladesh are almost same, both are chronic in nature and incurred high cost to the patients. That's why these two diseases have undertaken to compare and contrast. The term "diabetes" refers to a group of metabolic diseases characterized by hyperglycaemia resulting from defects in insulin secretion, insulin action, or both. Several pathogenic processes are involved in the development of diabetes. These range from autoimmune destruction of the beta cells of the pancreas in Type 1 diabetes with complete insulin deficiency, to abnormalities that result in resistance to insulin action as in Type 2 diabetes. The chronic hyperglycaemia associated with diabetes is associated with long-term damage, dysfunction, and failure of various organs, especially the eyes, kidneys, nerves, heart, and blood vessels.

Diabetes has profound effects on individuals and their families. The condition accounts for a large and growing cost to the health care system. If diabetes is not well monitored and managed, sustained high blood glucose levels, sustained high blood pressure and abnormalities of lipid metabolism cause damage to small and large blood vessels throughout the body, leading to long-term complications. Diabetes is a common problem in Bangladesh as it is worldwide. The complex and interrelated consequences and aftermath of such problem include short- and long-term morbidity. Certain complications from DH are notorious; moreover these cause life-threatening situations. Cost of care is comparatively low but benefit in terms of cost/ cost benefit is at a higher rate. And it would be worthwhile when the investment will be high here.

Asthma is a very common chronic disease that occurs in all age groups and is the focus of various clinical and public health interventions. Both morbidity and mortality from asthma are significant. Asthma management plans have, however, reduced mortality and severity in countries where they have been applied. Several barriers reduce the availability, affordability, dissemination and efficacy of optimal asthma management plans in both developed and developing countries. The economic cost of asthma is much more higher both in terms of direct medical costs (such as hospital admissions and the cost of pharmaceuticals) and indirect medical costs (such as time lost from work and premature death). Direct costs are significant in most countries. In order to reduce costs and improve quality of care, employers and health plans are exploring more precisely targeted ways of controlling rapidly rising health costs. Poor control of asthma symptoms is a major issue that can result in adverse clinical and economic outcomes. A model of asthma costs is needed to aid attempts to reduce them while permitting optimal management of the disease. The burden of asthma and its socioeconomic implications and proposes a model to predict the costs incurred by the disease. There is evidence that its prevalence has increased considerably over the last two decades and is still increasing, despite there being some indications that the increase in prevalence may have plateaued in some countries in the last few years. Better understanding of the natural course of asthma and improved

asthma control can lead to a decreased burden on the patient, their family and society. The burden of asthma consists mainly of a decreased quality of life for the patient and their family, as well as high costs for society; the healthcare expenditures for asthma in developed countries are 1-2% of the total healthcare costs.

Around nine percent of the islanders and offshore poor people of Patuakhali, Bhola, Laxmipur, Noakhali, Feni, Khulna, Chittagong and Cox's Bazar districts have become susceptible to asthma and Chronic Obstructive Pulmonary Diseases (COPD) due to heavily indoor pollution, doctors say. Asthma is a costly chronic disease that can be controlled with proper management but to some extend it is too costly. Asthma is a high-cost chronic illness in employment-based populations, but these costs are concentrated in a small number of patients. Identifying and managing high-cost patients using strategies such as disease management may not lead to cost savings.

As such health status with chronic disease of course adversely affects the over all GDP, employment, revenue and other variables as well. To eliminate those diseases and for reduction of the cost burden of these two chronic diseases there should be investment in that area where the cost in terms of benefit is much higher in returns.

Prevalence and economic burden of DM and Asthma and relative return of investment for the elimination or the reduction of the burden of these two chronic diseases are more important regarding its cost burden. The prevalence of diabetes and its adverse health effects has risen more rapidly in South Asia than in any other large region of the world. India has a higher number of people with diabetes than any other country, with estimates ranging from 19.4 million in 1995 to 32.7 million in 2000. In Bangladesh, the prevalence of diabetes in urban areas is double that in rural areas (8% *v* 4%) and rises with affluence. The International Diabetes Federation gives an estimate of 12% prevalence in Pakistan, with a total of 8.8 million people with diabetes in 2000. In Sri Lanka the 1999 census report records diabetes prevalence as 8% in rural areas and 12% in urban areas; equivalent current rates for Nepal have been reported as 3% and 15% respectively. Population-based

study confirms that the prevalence of asthma in Bangladesh is high. The prevalence among children was found to be higher than among adults. Children under 5 years were excluded from the study. It seems likely that respiratory viral infections have an important part to play in the production of wheeze in young children. Asthma is also more prevalent in people belonging to lower socioeconomic groups and adult populations of lower educational status.

Socioeconomic and demographic scenario and epidemic transition of Bangladesh shows that the noncommunicable diseases are increasing in a rapid rate. Health scenario and epidemic transaction: in these days the communicable diseases are declining because of improvement in health service delivery. And due to life style modification, rapid urbanization, less exercise the non communicable disease are increasing as well. And when the trend becomes equal then it's the break even point. With the development of the technology day by day the non communicable disease are increasing at a raid rate. Like the hypertension, asthma, cancer etc.

Some of the study has been conducted on different issue of diabetes and as well as asthma, but no study has been done on account of this issue. Though there is no study found in Bangladesh regarding this particular menace; but findings from international studies and clinical researches show that if appropriate and adequate management can be given routinely and during the emergency including casualty, such complications can be combated effectively and successfully in the immediate and long run.

Economic and non economic effects of the two diseases are as follows-
Non economic effects are those which affect the family and the relevant areas not only in terms of money but also in terms of many other variables like the productivity loss, deprivation and so on which has an adverse affect on each and every one.

Traditional medical management approaches taken by health plans have done little to stem the increasing costs associated with asthma, much less do anything to promote better

outcomes for and improve the quality of life of participants suffering from asthma. Greater physician compliance with asthma practice guidelines such as those published by the National Heart, Lung and Blood Institute could greatly reduce the morbidity associated with asthma but utilization review programs generally do not promote such compliance.

In recent years, more and more health plans have turned to disease state management as an answer to the asthma problem. Disease management programs utilize multidisciplinary care management, consultation by asthma specialists, treatment protocols based upon nationally accepted standards of care, and patient and caregiver education in a strategy aimed at preventing acute exacerbations, thereby reducing inpatient and emergency room utilization by asthmatics. Health and economic outcomes data is used to measure the effectiveness of the disease stage management program. Outcomes research has indeed proven that disease state management and intervention programs can be very effective at reducing morbidity and resource consumption associated with asthma. One 1998 study estimated $4,845 per patient in annual resource savings after 22.8 months of follow-up in case of Asthma.

The principal problem with disease management programs for asthma is their reliance upon claims data analysis for case finding. Lack of standard criteria for identifying asthmatics and the reluctance of providers to label patients as asthmatic because of concerns about patient insurability mean that asthma is under-reported in claims data. Use of claims data typically involves delays of 3 to 6 months before a patient can be identified and disease management can be implemented. This delay results in increased morbidity and much lost savings opportunity.

The prevalence of diabetes and its adverse health effects has risen more rapidly in South Asia than in any other large region of the world. India has a higher number of people with diabetes than any other country, with estimates ranging from 19.4 million in 1995 (*King H et al,* **Diabetes Care** 1998; p-1414-31) to 32.7 million in 2000. (International Diabetes Federation. **Diabetes Atlas** 2000. Brussels: IDF, 2000)

In Bangladesh, the prevalence of diabetes in urban areas is double that in rural areas (8% v 4%) and rises with affluence. (Abu Sayeed M, **Diabetes Care** 1997; p-551-555) The International Diabetes Federation gives an estimate of 12% prevalence in Pakistan, with a total of 8.8 million people with diabetes in 2000. In Sri Lanka the 1999 census report records diabetes prevalence as 8% in rural areas and 12% in urban areas; equivalent current rates for Nepal have been reported as 3% and 15% respectively.

Economic and non economic effects of the two diseases:
Non economic effects are those which affected the family and the relevant areas not only in terms of money but also in terms of many other variables like the productivity loss, deprivation and so on which has an adverse affect on each and every one.

The main Objective of the study is to observe the total burden (economic and non-economic) is higher and management is more cost-effective for diabetes than that for asthma.

The study has following interrelated objectives:

To assess disease burden,

To calculate the economic burden such as direct and indirect cost for both the diseases.

Cost of management of preventive as well as curative for diabetes and asthma,

Compare the economic efficiency of the management of these two diseases.

To calculate return from the investment in underlying intervention to managing the diabetes and asthma,

To analyze the implication for the household economy and national economy.

To deduce policy implication for maintaining these two diseases

So the research issue is to investigate whether early prevention and curative measure in case of diabetes can substantially reduce the economic and non-economic cost and disease burden, can increase survival and the interval without complications than that of asthma.

and whether cost effectiveness ratio will be able to compare favorably with many accepted healthcare programmes.

The underlying hypothesis is that the total burden (economic and non-economic) is higher and management is more cost-effective for diabetes than that for asthma.
In case of diabetes it is more easier to mange the condition in a proper way as long as it would be on the grip of control it would be cost saving and clinically effective also. On the other hand when it's the issue of asthma it may be prevent at an early stage. As it's an emergency so when it arise we couldn't manage it in a very easy way, it costs a lot.

Diabetes has profound effects on individuals and their families. The condition accounts for a large and growing cost to the health care system. If diabetes is not well monitored and managed, sustained high blood glucose levels, sustained high blood pressure and abnormalities of lipid metabolism cause damage to small and large blood vessels throughout the body, leading to long-term complications. These may be prevented and delayed with intensive blood glucose control, blood pressure control and through healthy lifestyle practices of appropriate nutritional diet, increasing regular physical activity and weight reduction. Earlier prevention, management and treatment and regular monitoring may prevent or limit the progression of these complications to blindness, end-stage kidney failure, neuropathy, and cardiovascular disease. Although it may be in severe case if the management procedure couldn't be followed properly but still investment on it in a small amount could be both clinically and economically cost effective. Rather in case of asthma, it is a costly chronic disease that can be controlled with proper management. The costs associated with those patients' asthma-related hospitalizations, emergency department (ED) and outpatient visits, and pharmaceutical use. Asthma is a high-cost chronic illness, but these costs are concentrated in a small number of patients. Identifying and managing high-cost patients using strategies such as disease management may lead to cost savings in a small amount. Both morbidity and mortality from asthma are significant. Several barriers reduce the availability, affordability, dissemination and efficacy of optimal asthma management plans in both developed and developing countries. The workplace

environment contributes significantly to the general burden of asthma. Patients with occupational asthma have higher rates of hospitalization and mortality than healthy workers. The economic cost of asthma is considerable both in terms of direct medical costs (such as hospital admissions and the cost of pharmaceuticals) and indirect medical costs (such as time lost from work and premature death). Poor control of asthma symptoms is a major issue that can result in adverse clinical and economic outcomes.

So the research issue is to investigate whether early prevention and curative measure in case of diabetes can substantially reduce the economic and non-economic cost and disease burden, can increase survival and the interval without complications than that of asthma, and whether cost effectiveness ratio will be able to compare favorably with many accepted healthcare programmes.

The underlying hypothesis is that the total burden (economic and non-economic) is higher and management is more cost-effective for diabetes than that for asthma.

The introductory chapter includes the description of the disease pattern properly and a brief description of these two chronic disease properly. Mainly its types verity, cost of treatment and management as well as its complication related cost, to some extend its extension and burden. So the research issue is to investigate whether early prevention and curative measure in case of diabetes can substantially reduce the economic and non-economic cost and disease burden, can increase survival and the interval without complications than that of asthma, and whether cost effectiveness ratio will be able to compare favorably with many accepted healthcare programmes. The underlying hypothesis is that the total burden (economic and non-economic) is higher and management is more cost-effective for diabetes than that for asthma. In case of diabetes it is more easier to mange the condition in a proper way as long as it would be on the grip of control it would be cost saving and clinically effective also. On the other hand when it's the issue of asthma it may be prevent at an early stage. As it's an emergency so when it arises we couldn't manage it in a very easy way, it costs a lot. The main Objective of the study is to observe the total

burden (economic and non-economic) is higher and management is more cost-effective for diabetes than that for asthma. Economic effects: Million of people live with chronic illnesses. Chronic diseases account for 70% of all deaths all over the world and Bangladesh as well. The medical care costs of people with chronic diseases account for more than 75% of the nation's medical care costs. Chronic diseases account for one-third of the years of potential life lost before age 65. Hospitalizations cost is more in case of chronic disease. The direct and indirect costs of diabetes are nearly $140 a year. Evidence on the importance of chronic disease burden on human-capital and fertility decisions in developing regions. Social and economic effects of chronic disease include functional impairment, disability or lost work productivity, and increased use of health services. Patients with comorbid chronic medical illness as in the total population with depressive disorders. Fewer data are available regarding social and economic burden of these diseases, but available data show cross-sectional associations between mood symptoms and functional impairment, disability, and health care costs. Taken together, these data describe the substantial social and economic burden of chronic disease and the potential benefits of more effective treatment.

In the literature review chapter some of the studies have been reviewed properly to see that whether as such studies has been done in world wide contest. After reviewing all those no such studies has been found in this issue or regards. So its a pioneer study and would provide us important information regarding the burden. However, those economic benefits of treatment for diabetes are secondary to the principal objective of relieving human suffering. People living with chronic diseases like diabetes are especially facing an increasing demand for long-term continuous health care services and burden of health care cost. Thus in both developing and industrial countries, further increase in health care spending should be carefully planned. Many countries are now engaging in health care reforms designed to curtail the cost burden. Some of the study regarding different chronic and noncommunicable diseases are well exposed in developed countries but almost absent in developed countries. A model of asthma costs is needed to aid attempts to reduce them while permitting optimal management of the disease. The discussion of the burden of

asthma and its socioeconomic implications and proposes a model to predict the costs incurred by the disease.

Diabetes mellitus is a leading cause of premature morbidity and mortality in general population all over the world. The recent World Health Organization (WHO) report on diabetes prevalence alarmed that diabetes has posed a serious threat to developing countries in respect to their existing health care services (*King H and Rewers M.* **Diabetes Care** 1993; 16: 157-177). International comparisons of prevalence and characteristics of asthma have been greatly facilitated by the completion of two major initiatives in asthma epidemiology—the European Commission Respiratory Health Study (ECRHS) and the International Study of Asthma and Allergies in Childhood (ISAAC). Since the nationwide prevalence of asthma was not known, this study was undertaken to determine the prevalence and associated factors of asthma and wheeze in Bangladesh in all age groups.

Asthma is a substantial health problem among children and adults worldwide, with increasing prevalence rates in many countries. If 10% of children and 5% of adults have asthma, figures that are conservative for developing countries but may be overestimates in some developing countries, the global burden of asthma is in the order of 130 million people. Mortality rates from asthma in western countries vary between one and five per 100 000, and result in some 60 000 deaths annually, many of which occur in young people and are preventable.

So different prospect of these two diseases has been discussed in different studies in different settings. But no studies are shown to find out the total burden specially the non economic cost burden, that's why this study has undertaken to investigate the issue and find the outcomes.

In the third chapter methodology has been described. Primary data has been collected from patients who is undergoing treatment for diabetic at the Out Patient Department of BIRDEM, and NHN, Dhaka & Asthma patient from The Asthma Centre. Cross sectional study which will be analytical and retrospective in nature. The samples will be in two groups. Out Patient Department of BIRDEM, and NHN, Dhaka & Asthma Centre at Dhaka. A total of 200 patients will be selected purposively. Of them 100 will be patients with type 2 diabetes and 100 will be Asthma patients. Diabetes patients, minimum 2 years of duration, registered at BIRDEM or NHN. Chronic Asthma patients, minimum 2 years of duration, registered at Asthma Centre. Secondary data will be collected from the published records regarding the treatment and management of chronic diseases. The main variables are degree and extent of complications, treatment outcome, clinical effectiveness, functional level, consumer's out of pocket expense, indirect cost of consumer, disease burden, economic cost. Data analysis procedure will be managed by the appropriate statistical technique. Disease burden will be calculated through DALY method, cost will be calculated considering all the inputs as well as opportunity cost forgone, cost of interviewers will be calculated using the average cost incurred per patients in or diabetes and asthma centre as well as associated cost incurred in the house. Attempts will also be made to identify the factor which causes high cost-effective of intervention, using different multivariate analysis. All costs will be reported in 2006 values of Taka and US$.

Disease Burden will be calculated as follows-

The burden for people living with a condition (the morbidity burden) is described in terms of Years of Healthy Life Lost to Disability, or YLDs. Disability in this context refers to any departure from a state of perfect health, not just the group of conditions traditionally included under the heading of "disabilities".

In the fourth chapter results has been discussed. Age, sex, socioeconomic status, demographic distribution, education level, complications, physical activity level and component wise cost distribution of these two diseases has been describe through percentage and other statistical distribution. Total cost, average cost and unit cost has also

been calculated in different component wise. Cost-effectiveness ratio and different types of cost analysis has been done. EuroQol has been calculated for to provide comparative weight for these two diseases.

In chapter five conclusion and summary has been briefly described. Mainly the summary of the results has been shown. Academic and policy recommendation also been suggested here. Some of the procedure for the good management has also been recommended. Limitation of the study has also been included here for apology.

In chapter six brief bibliography is written to support the whole thesis.

Appendixes are enclosed along with details. Questionnaire of the study has been described briefly here. Some of the tables and graphs are shown which are not included in the main results.

LITERATURE REVIEW

2. BURDEN OF DIABETES AND ASTHMA: REVIEW OF LITERATURE

2.1 Introduction: The World Health Organization (WHO) stated in 2002 that "in many regions, some of the most formidable enemies of health are joining forces with the allies of poverty to impose a double burden of disease, disability and premature death in many millions of people." This is what is happening in South Asia, which has one quarter of the global population but where about half the population lives below the poverty line and has limited access to health care. Although infectious diseases remain a formidable enemy, the population is ageing and non-communicable diseases are rising. (World Health Organization. *The world health report 2002. Reducing risks, promoting healthy life*. Geneva: WHO, 2002. World Health Organization. *Noncommunicable diseases in South-East Asia region. A profile*. New Delhi: WHO, 2002. Murray CJL, Lopez AD, eds. *Global burden of disease*. Harvard, MA: Harvard School of Public Health, 1996. Vol 1 of Global Burden of Disease and Injury series. World Health Organization. *Health situation in the South-East Asia region 1998-2000*. New Delhi: WHO, 2002). South Asia has made fair economic progress in recent decades but is struggling to find a road towards sustainable development. Through reviewing the estimated burden of noncommunicable diseases in South Asia, the risk factors for these diseases, the limitations of the available data, and the attempts being made to gather evidence of better quality. So now the aim is to provide a profile of non-communicable disease burdens in this region.

2.2 Burden of Chronic Diseases: Chronic diseases such as heart disease, cancer, asthma and diabetes are leading causes of disability and death in the United States. Every year, chronic diseases claim the lives of more than 1.7 million Americans. These diseases are responsible for 7 of every 10 deaths in the United States. Chronic diseases cause major limitations in daily living for more than 1 of every 10 Americans, or 25 million people. These diseases account for 75% of the $1 trillion spent on health care each year in the United States.

Although chronic diseases are among the most prevalent and costly health problems, they are also among the most preventable. Effective measures exist today to prevent or delay much of the chronic disease burden and curtail its devastating consequences.

Chronic diseases are generally not prevented by vaccines or cured by medication, nor do they just disappear. To a large degree, the major chronic disease killers—heart disease, cancer, stroke, chronic obstructive pulmonary disease, and diabetes—are an extension of what people do, or not do, as they go about the business of daily living. Health-damaging behaviors—in particular tobacco use, lack of physical activity, and poor eating habits—are major contributors to heart disease and cancer, our nation's leading killers. These behaviors also increase peoples' risk for other serious chronic diseases such as diabetes. A single behavior—tobacco use—is responsible for over 80% of the deaths each year from chronic obstructive pulmonary disease, the nation's fourth leading cause of death. Clearly, promoting healthy behavior choices, through education and through community policies and practices, is essential to reducing the burden of chronic diseases.

In addition, we have the tools in hand to detect certain chronic diseases in their early stages, when treatment is most effective. Regular screening can detect cancers of the breast, cervix, colon, and rectum and is also critical for preventing the debilitating complications of diabetes, including blindness, kidney disease, and lower-extremity amputations. Screening and appropriate follow-up for high blood pressure and elevated cholesterol can save the lives of those at risk for heart disease and stroke. Access to high-quality and affordable prevention measures for all Americans is essential if we are to save lives and reduce medical care costs.

The Burden of Chronic Diseases and Their Risk Factors: National and State Perspectives—formerly known as *Chronic Diseases and Their Risk Factors: The Nation's Leading Causes of Death*—provides updated information on the prevalence of selected chronic diseases and their risk factors in the 50 states and the District of Columbia. CDC is pleased to announce several changes to this 2002 publication. First, heart disease and

stroke are presented separately rather than being grouped as cardiovascular disease. Second, the document now includes the burden of overweight among young people as well as adults. This significant risk factor is believed to contribute too many chronic diseases, including the growing number of cases of type 2 diabetes among young people.

This document is intended to aid policy makers, the public health community, and others interested in addressing the burden of chronic disease in the United States. Another generation of Americans need not suffer unnecessarily or die prematurely when so much is already known about how to prevent disability and death from chronic diseases. The Burden of Chronic Diseases and Their Risk Factors: National and State Perspectives 2004 provides updated information on the burden of chronic diseases and their risk factors in the 50 states and the District of Columbia, including

A national perspective on chronic diseases as major causes of death. State-specific data on rates of death due to heart disease, cancer, stroke, and diabetes. Information on prevalence of major risk factors for chronic diseases and on the use of preventive services. Profiles of chronic diseases, risk factors, and preventive services in each state. Information on CDC funding to states for programs that target chronic diseases and their risk factors.

The profile of diseases contributing most heavily to death, illness, and disability among Americans changed dramatically during the last century. Today, chronic diseases—such as cardiovascular disease (primarily heart disease and stroke), cancer, and diabetes—are among the most prevalent, costly, and preventable of all health problems. Seven of every 10 Americans who die each year, or more than 1.7 million people, die of a chronic disease. The prolonged course of illness and disability from such chronic diseases as diabetes and arthritis results in extended pain and suffering and decreased quality of life for millions of Americans. Chronic, disabling conditions cause major limitations in activity for more than one of every 10 Americans, or 25 million people.

2.3 Costs of Chronic Disease: The United States cannot effectively address escalating health care costs without addressing the problem of chronic diseases:
More than 90 million Americans live with chronic illnesses. Chronic diseases account for 70% of all deaths in the United States. The medical care costs of people with chronic diseases account for more than 75% of the nation's $1.4 trillion medical care costs. Chronic diseases account for one-third of the years of potential life lost before age 65. Hospitalizations for pregnancy-related complications occurring before delivery account for more than $1 billion annually. The direct and indirect costs of diabetes are nearly $132 billion a year. Each year, arthritis results in estimated medical care costs of more than $22 billion, and estimated total costs (medical care and lost productivity) of almost $82 billion. The estimated direct and indirect costs associated with smoking exceed $75 billion annually. In 2001, approximately $300 billion was spent on all cardiovascular diseases. Over $129 in lost productivity was due to cardiovascular disease. The direct medical cost associated with physical inactivity was nearly $76.6 billion in 2000. Nearly $68 billion is spent on dental services each year.

2.4 Cost-Effectiveness of Prevention: For every $1 spent on water fluoridation, $38 is saved in dental restorative treatment costs. For a cost ranging from $1,108 to $4,542 for smoking cessation programs, 1 quality-adjusted year of life is saved. Smoking cessation interventions have been called the gold standard of cost-effective interventions. The direct medical cost associated with physical inactivity was $29 billion in 1987 and nearly $76.6 billion in 2000. Engaging in regular physical activity is associated with taking less medication and having fewer hospitalizations and physician visits.

For each $1 spent on the Safer Choice Program (a school-based HIV, other STD, and pregnancy prevention program), about $2.65 is saved on medical and social costs. For every $1 spent on preconception care programs for women with diabetes, $1.86 can be saved by preventing birth defects among their offspring. According to one Northern California study, for every $1 spent on the Arthritis Self-Help Program, $3.42 was saved in physician visits and hospital costs. A mammogram every 2 years for women aged 50–69

costs only about $9,000 per year of life saved. This cost compares favorably with other widely used clinical preventive services. For the cost of 100 Papanicolaou tests for low-income elderly women, about $5,907 and 3.7 years of life are saved.

After controlling for physical limitation and major socioeconomic factors, more than 12% of annual medical costs of the inactive persons with arthritis is associated with physical inactivity. Physical activity interventions may be a cost-effective strategy for reducing the burden of arthritis.

DALYs combine losses from premature death (defined as the difference between the actual age of death and life expectancy at that age in a low-mortality population), and loss of healthy life resulting from disability. In simple terms, a DALY strives to tally the complete burden that a particular disease exacts. Key elements to consider include the age at which disease or disability occurs, how long its effects linger, and its impact on quality of life. Losing one's sight at age 7, for instance, is a greater loss than losing one's sight at 67. Similarly, a bout of acute illness that is over quickly counts less in the DALY calculation than one that leaves lingering weakness, such as persistent worm infections.

This new indicator can be used in different ways to compute the total burden of a particular disease, such as malaria (which accounts for some 65,578,000 DALYs per year), or to tally up the total global burden of disease (in 1990 the world's population lost 2,480,237,000 DALYs), or to compare the relative burden of disease among different regions of the world.

Nearly nine tenths of the global burden of disease occurs in developing regions where only 1 in 10 health care dollars are spent. As the Disproportionate Disease Burden in Africa shows, sub-Saharan Africa suffers twice the burden of ill health as the global average and nearly five times more than the richest countries. Using this new metric, communicable diseases are the single most important cause of ill health globally, accounting for 44 percent of the total. (Deaths versus DALYs compare the 10 leading causes of death with

the 10 leading causes of DALYs.) This increase in the relative importance of infectious diseases reflects in large part the early age at which they strike. Of the top 10 causes of DALYs globally, communicable diseases account for 7, with lower respiratory infections and diarrhoeal diseases heading the list. DALYs also underscore the disproportionate burden of ill health borne by the world's children. Children under age 15 account for almost one half of all lost DALYs worldwide.

Between 1990 and 1994 the canton of Geneva lost 235 000 DALY every year to disability (53%) and premature death (47%). Men have an excess mortality at all ages. They contributed more (54% of total DALY) to the disease burden than women and accumulated 60% of all YLL. By age groups, contributions to DALY were similar in both sexes, highest in the 15–44 age groups, and lowest in children 5–14 years. Disability is proportionally more important than premature death in the 5–14 and 15–44 age groups (62.5% and 69% of the overall burden of disease attributable to disability, respectively), whereas mortality contributes more to the disease burden at age 60 and beyond (65.8% of the disease burden due to mortality).

2.5 Burden of disease by major disease groups: Overall, non-communicable diseases (Group II) accounted for 79% of the DALY, injuries represented 12%, and Group I (communicable diseases, maternal, perinatal and nutritional disorders) just 9%. Disability contributed more to DALY than premature death in Group II (59% DALY), while mortality was more important in Groups I and III (66% and 71%, respectively). Men and women contributed equally to DALY for non-communicable diseases, while men suffered more from injuries and communicable diseases (67.3% and 58.1%, respectively). Non-communicable diseases are the most important cause of DALY at all ages. The DALY from injuries and communicable diseases are highest for the 15–44 age group decreasing thereafter.

It was found that the percentage of asthmatic patients to the general medical care expenditures has been on the steady increase. A closer examination revealed that the

percentage of asthmatic outpatients receiving care increased while those receiving care as inpatients decreased. The relationships between the percentage of the number of asthmatic patients utilizing medical services and the expenditures for their care differed between inpatients and outpatients. Sequential Evaluation of the National Medical Expenditures for Asthma Care in Japan. (*Engstrom G* **Journal of Epidemiology Community Health** 2000 Feb; p-104- 7)

A study was done on school going children. Asthma is one of the most common chronic diseases of childhood and is the most common cause of school absenteeism due to chronic conditions. The objective of this study is to estimate direct and indirect costs of asthma in school-age children. Using data from the 1996 Medical Expenditure Panel Survey, we estimated direct medical costs and school absence days among school-age children who had treatment for asthma during 1996. We estimated indirect costs as costs of lost productivity arising from parents' loss of time from work and lifetime earnings lost due to premature death of children from asthma. All costs were calculated in 2003 dollars. In 1996, an estimated 2.52 million children aged five to 17 years received treatment for asthma. Direct medical expenditure was $1009.8 million ($401 per child with asthma), including payments for prescribed medicine, hospital inpatient stay, hospital outpatient care, emergency room visits, and office-based visits. Children with treated asthma had a total of 14.5 million school absence days; asthma accounts for 6.3 million school absence days (2.48 days per child with asthma). Parents' loss of productivity from asthma-related school absence days was $719.1 million ($285 per child with asthma). A total of 211 school-age children died of asthma during 1996, accounting for $264.7 million lifetime earnings lost ($105 per child with asthma). Total economic impact of asthma in school-age children was $1993.6 million ($791 per child with asthma).The economic impact of asthma on school-age children, families, and society is immense, and more public health efforts to better control asthma in children are needed.

To assess the effectiveness of disease management as an adjunct to treatment for chronic illnesses, such as asthma, and to evaluate whether the statistical phenomenon of regression

to the mean is responsible for many of the benefits commonly attributed to disease management. In the intervention group, 388 asthmatics entered and 258 completed the 6-month program; 446 subjects participated in the control group. Facilities charges were compared for both groups during the baseline and program periods. Both groups were well matched demographically and for costs at baseline. Using the intervention group as its own control revealed a 49.1% savings. The control group savings were 30.7%. Therefore, the net savings were 18.4% ($P < .001$) for the intervention group vs controls. Although the demonstrated savings were less using a control group to correct for regression to the mean, they were statistically significant and clinically relevant. When using a control group to control for the statistical effects of regression to the mean, a disease management intervention for asthma in a population covered by Medicaid is effective in reducing healthcare costs.

Asthma is a very serious chronic disease affecting more than 17 million Americans. Pediatric asthma is the leading cause of chronic illness in children, with an estimated prevalence as high as 8 percent, and is the cause of an estimated 13 million physician visits and 200,000 inpatient hospitalizations each year. Asthma is common in adults as well, affecting 5 to 10 percent by some estimates. Overall, between 9 and 12 million Americans are presently diagnosed as having asthma.

The incidence of asthma appears to be increasing. Between 1988 and 1997, the overall hospital discharge rate increased by 6.7 percent. From 1982 to 1996, the overall prevalence of the disease increased by 58.6 percent, with the highest increase (123.4 percent) seen in working-aged adults 18 to 44.

Between 1979 and 1997, a period during which the death rate attributed to all causes decreased by 17 percent and 8 out of 10 of the leading causes of death experienced decreases, asthma mortality actually increased by 55.6 percent. This rise in the incidence and mortality of asthma has been particularly notable in inner cities, possibly related to

worsening environmental conditions such as outdoor air pollution. Asthma Disease Management: Regression to the Mean or Better? (**Am J Manag Care.** 2004; 10: 948-954)

2.6 Burden of non-communicable diseases in South Asia

This study contains evidence on the importance of chronic disease burden on human-capital and fertility decisions in developing regions. The episode analyzed is the eradication of hookworm disease in the American South. In previous work (Bleakley 2002), it was shown that the hookworm eradication led to a significant increase in school attendance and literacy. The present study shows that this increase in human capital was accompanied by a fertility decrease that was both economically and statistically significant. A decline in the hookworm infection rate from 40 to 20% is associated with a decline in fertility that amounts to 40% of the entire fertility decline in the American South between 1910 and 1920. These results can be used to test a number of theoretical models on the interaction of fertility and human capital investments in growth. It provides broad support for non-linear budget sets in the number and quality of children as first analyzed by Becker-Lewis (1973). It also strengthens the empirical support for the emerging literature (e.g. Becker, Murphy and Tamura (1990), Doepke (2002) and Soares (2002)) linking human capital investment and fertility in models of economic growth and demographic transitions. The evidence presented here rejects the Barro-Becker (1988) formulation with a single dynastic budget set.

Disability-Adjusted Life Year (DALY) measures the burden of disease. To measure the state of health of a population and, together with the related concept of cost-effectiveness, to judge which interventions to improve health deserve the highest priority for public action, "Investing in Health" makes extensive use of the concept of the Disability-Adjusted Life Year (DALY). The DALY has emerged as a measure of the burden of disease and it reflects the total amount of healthy life lost, to all causes, whether from premature mortality or from some degree of disability during a period of time. These disabilities can be physical or mental. The intended use of the DALY is to assist (i) in setting health service priorities; (ii) in identifying disadvantaged groups and targeting of

health interventions; and (iii) in providing a comparable measure of output for intervention, program and sector evaluation and planning.

The number of DALYs estimated at any moment reflect the amount of health care already being provided to the population, as well as the effects of all other actions which protect or damage health. Where treatment is possible--whether preventive, curative or palliative--the effectiveness of the intervention is the reduction in disease burden which the treatment produces. Effectiveness is measured in the same units (DALYs) as disease burden, and so can be compared across interventions which treat different problems and produce different outcomes. In other words, the DALY can be used to measure the gains in health attributable to different actions and add them up.

The proponents of the DALY use this measure for two purposes: (i) to measure the burden of disease, and (ii) to increase the allocative efficiency of the sector by identifying health interventions that, for a given budget, will purchase the largest improvement in health, as measured by the burden of disease indicator (DALY).

Between 1990 and 1994 the canton of Geneva lost 235 000 DALY every year to disability (53%) and premature death (47%). Men have an excess mortality at all ages. They contributed more (54% of total DALY) to the disease burden than women and accumulated 60% of all YLL. By age groups, contribution to DALY was similar in both sexes, highest in the 15–44 age groups, and lowest in children 5–14 years. Disability is proportionally more important than premature death in the 5–14 and 15–44 age groups (62.5% and 69% of the overall burden of disease attributable to disability, respectively), whereas mortality contributes more to the disease burden at age 60 and beyond (65.8% of the disease burden due to mortality).

Compared the results with the overall DALY estimates for EME countries in the Global Burden of Disease study. The crude rate of DALY per 1000 inhabitants per year is similar in Geneva (123.7) and in EME (123.8). The main differences appear in the relative weight

attributed to certain diseases or injuries. A higher proportion of DALY comes from HIV/AIDS in Geneva (4.8%) than in EME (1.3%). Cardiovascular diseases are proportionally less important in Geneva (14% versus 18.6%), while neuropsychiatric conditions (30.3% versus 25%) and malignant neoplasms (16.1% versus 15%) are proportionally more important in Geneva than in EME. The relative contribution of DALY due to unintentional injuries is similar in EME and Geneva (8%). However, the weight of specific conditions differs. For example, traffic accidents have a greater importance in EME (4.4%) than in Geneva (2.5%), while poisoning (acute reaction or drug overdose) represents 1.6% in Geneva and 0.3% in EME. Intentional injuries are also more important in Geneva because suicides represent 3.8% of total DALY in Geneva, but only 2.2% in EME.

Social and economic effects of mood disorders include functional impairment, disability or lost work productivity, and increased use of health services. Evidence for these impacts includes cross-sectional studies, longitudinal studies, and true experiments (randomized trials of specific treatments or treatment programs). With respect to unipolar depression, strong evidence demonstrates that depression is associated with significant functional impairment and that effective treatment helps to restore function. Studies of the effect of depression on work disability and health care costs show strong cross-sectional associations (i.e., greater disability and higher costs among those with depression) and longitudinal associations (i.e., improvement in depression is associated with reduced disability and lower costs). All of these findings regarding unipolar depression seem as consistent in the subgroup of patients with comorbid chronic medical illness as in the total population with depressive disorders. Fewer data are available regarding social and economic burden of bipolar disorder, but available data show cross-sectional associations between mood symptoms and functional impairment, disability, and health care costs. Taken together, these data describe the substantial social and economic burden of mood disorders and the potential benefits of more effective treatment. We must recall, however, that economic benefits of treatment for mood disorders are secondary to the principal objective of relieving human suffering.

2.7 Burden of Diabetes: Diabetes mellitus is a leading cause of premature morbidity and mortality in general population all over the world. The recent World Health Organization (WHO) report on diabetes prevalence alarmed that diabetes has posed a serious threat to developing countries in respect to their existing health care service (*King H and Rewers M.* **Diabetes Care** 1993; p-157-177). Another joint reports of the WHO and International Diabetes Federation predict that the diabetic population in the world will be double in the next 15 years and the increase in number of the patients is proportionately greater in developing countries (*Edited by Wolfgang Gruber, Teresa Lander, Brenda Leese, Thomas Songer and Rhys Williams.* The Economics of Diabetes and Diabetes Care, A Report of the Diabetes Health Economics Study Group. International Diabetes Federation and world Health Organization.). Diabetes and hyperinsulinemia are more prevalent in Bangladeshis compared with other South Asian migrants (Indian, Pakistan) settled in United Kingdom (*McKeigue PM,* **J Clin Epeidemiol** 1989; p- 597-609) and with the native population (*McKeigue PM,* **Lancet** 1991; p-382- 386. *McKeigue PM,* **Diabetologia** 1992; p-785-791.). Among the non-communicable diseases diabetes is emerging as a major health problem in Bangladesh, which has now given high research priorities by the government of Bangladesh (The current status of Health Research in Bangladesh (1991): submitted by The Essential Health Research Working Group in Bangladesh.). Change in life-style and food habit, rapid and unplanned urbanization and environmental pollution are mainly responsible for the predicted epidemic. Strict glycemic control is now treated as the cornerstone for the management of diabetes mellitus (*The Diabetes Control and Complication Trial Research Group.* **NEJM** 1993; p-977-986. *UK Prospective Diabetes Study (UKPDS) Group.* Intensive blood-glucose control with sulfonylureas or insulin compared with conventional and risk of complications in patients with type-2 diabetes. (UKPDS 33 **Lancet** 1998; p- 837-853). People living with diabetes are especially facing an increasing demand for long-term continuous health care services and burden of health care cost. Change in life-style and food habit, rapid and unplanned urbanization and environmental pollution are mainly responsible for the predicted epidemic. The socioeconomic status and education level has a strong influence on awareness, which can

be an ideal indicator to control over the glycemic control (*Bone LR.* **Ethn Dis** 2000 Winter; p- 87-95. *Hart CL.* **Am J Public Health** 2000 Nov; p- 1788- 91. *Engstrom G.* **J Epidemiol Community Health** 2000 Feb; p- 104- 7).

Ultimately this can be a measure of cost minimization of diabetes care that may improve the health status and burden of the disease by reducing the complications (*Shobhana R, Rao PR, Lavanya A, Vijay V, Ramachandran A.* Cost burden of diabetic patients with foot complications—a study from Southern India. **J Assoc Physicians India** 2000 Dec; 48 (12): 1147-50).

On the other hand, medical advances and new treatments have created continual demands on limited resources. Many individuals have limited access to adequate health care, and many countries are unable to provide it universally. The prevalence of diabetes and its adverse health effects has risen more rapidly in South Asia than in any other large region of the world. India has a higher number of people with diabetes than any other country, with estimates ranging from 19.4 million in 1995 to 32.7 million in 2000.

2.7.1 Burden of Diabetes in Bangladesh: The estimated prevalence of diabetes in Bangladesh is around 4% which is similar to the average prevalence in many other countries, but the prevalence of impaired glucose tolerance (IGT) here varies between 7.5-13% depending on urban and rural backgrounds. The prevalence of IGT thus seems to be little higher in our country. Since IGT subjects are potential diabetic patients, there are reasons to become worried. All these facts indicate that we have a difficult task ahead to combat diabetes. Some small surveys on diabetes at community level showed increasing prevalence (*West KM, Kalbfleisch JM.* Glucose tolerance, nutrition and diabetes in Uruguay, Venezuela, Malaya and East Pakistan. Diabetes 1966; 15: 9-18. *Mahtab H. Ibrahim M, Banik NG, Gulshan- E-Jahan and Ali SMK.* Diabetes detection survey in a rural and semiurban community in Bangladesh. **Tohoku J Exp Med** 1983; 141: 211- 217) The estimated prevalence of diabetes in Bangladesh is around 4% which is similar to the average prevalence in many other countries, but the prevalence of impaired glucose

tolerance (IGT) here varies between 7.5-13% depending on urban and rural backgrounds (*Thomas J Songer.* The Economics of Diabetes Care: USA. International Textbook of Diabetes Mellitus, Second edition).

To expand these services to the vast number of uncared diabetic population, a careful evaluation of the existing system is needed so that the possibilities for its improvement as well as for integration with other Govt and non-Govt health care delivery systems can be considered. A basic prerequisite for such analysis would be to collect information about the cost of the present services in a scientific way which would open the opportunity for more advanced economic analysis of the system. Even the primary information on the cost of diabetes care has never been systematically compiled in Bangladesh. Thus, it has become a priority to conduct a study in this field and the present proposal is the first attempt in this regard. Provided the fact that almost all diabetic patients come to DAB-related clinics for diabetes care (even those diagnosed outside are referred to these centres) it has becomes feasible to plan such an investigation with reasonable accuracy. However, in the perspective of the controversies on indirect and intangible costs of illness and in the light of the lack of systematic data in DAB related centers on these aspects, the study will be limited only to direct cost of diabetes care in these centers.

In Bangladesh, the prevalence of diabetes in urban areas is double that in rural areas (8% v 4%) and rises with affluence. The International Diabetes Federation gives an estimate of 12% prevalence in Pakistan, with a total of 8.8 million people with diabetes in 2000. In Sri Lanka the 1999 census report records diabetes prevalence as 8% in rural areas and 12% in urban areas; equivalent current rates for Nepal have been reported as 3% and 15% respectively.

Projections for 2020, based on modelled estimates by WHO, show a marked escalation of diabetes related burden in South Asia. The number of people with diabetes is expected to rise by 195% in India during 1995-2025 to reach 57.2 million in 2025. Pakistan is expected to have about 14.5 million people with diabetes by that year

2.8 Burden of Asthma: Asthma is a very common chronic disease that occurs in all age groups and is the focus of various clinical and public health interventions. Both morbidity and mortality from asthma are significant. The number of disability-adjusted life years (DALYs) lost due to asthma worldwide is similar to that for diabetes, liver cirrhosis and schizophrenia. Asthma management plans have, however, reduced mortality and severity in countries where they have been applied. Several barriers reduce the availability, affordability, dissemination and efficacy of optimal asthma management plans in both developed and developing countries. The workplace environment contributes significantly to the general burden of asthma. Patients with occupational asthma have higher rates of hospitalization and mortality than healthy workers. The surveillance of asthma as part of a global WHO programme is essential. The economic cost of asthma is considerable both in terms of direct medical costs (such as hospital admissions and the cost of pharmaceuticals) and indirect medical costs (such as time lost from work and premature death). Direct costs are significant in most countries. In order to reduce costs and improve quality of care, employers and health plans are exploring more precisely targeted ways of controlling rapidly rising health costs. Poor control of asthma symptoms is a major issue that can result in adverse clinical and economic outcomes. A model of asthma costs is needed to aid attempts to reduce them while permitting optimal management of the disease. The discussion of the burden of asthma and its socioeconomic implications and proposes a model to predict the costs incurred by the disease. The public health implications of asthma. Bull World Health Organ. 2005 Jul; 83(7): 548-54.

In a study on Swedish children with asthma experience their QoL and to search for possible associations between their experience of QoL and some determinants. Asthma is a chronic disorder that can restrict a child's life, physically, emotionally, socially and spiritually, and this has an impact on a child's quality of life (QoL). Two hundred and twenty-six children with asthma (37% girls and 63% boys) and 371 parents of these children participated in the study. The Paediatric Asthma Quality Of Life Questionnaire (PAQLQ) was used to measure the children's QoL. This questionnaire reveals how the

children's asthma interferes with their normal activities, their symptoms and how this interference has made them feel. The findings show that most children with asthma estimated their QoL towards the positive end of the scale. The children reported more impairment in the domain of activities than in emotions and symptoms. The most commonly restricted activity was the children's ability to run. Significant associations were found between a higher QoL outcome and being a boy, as well as living in the south of Sweden. A higher QoL was also found in children with mothers older than 40 years of age and in children with cohabiting parents. It was also associated with their fathers' QoL in a positive direction. It is important that children with asthma will maintain a high QoL. In this study the children were being treated with asthma medication when they evaluated their QoL. Perhaps this fact might have influenced the results in a positive direction. The findings of the study underline the importance of accurate nursing assessment including background variables of the children. Nurses also have to be aware that some of the children in the study have a low QoL and these children must not be forgotten. In addition, as caring tends to focus on the patients' limitations, another important issue for nurses is to try to discover those aspects in a child's daily life that contribute to a high QoL in order to improve and maintain the child's wellbeing. (Asthma quality of life for Swedish children. **Journal of Clinical Nursing**; 2005; 14: 739-749

Asthma is a substantial health problem among children and adults worldwide, with increasing prevalence rates in many countries. If 10% of children and 5% of adults have asthma, figures that are conservative for western countries but may be overestimates in some developing countries, the global burden of asthma is in the order of 130 million people. Mortality rates from asthma in western countries vary between one and five per 100 000, and result in some 60 000 deaths annually, many of which occur in young people and are preventable. International comparisons of prevalence and characteristics of asthma have been greatly facilitated by the completion of two major initiatives in asthma epidemiology—the European Commission Respiratory Health Study (ECRHS) and the International Study of Asthma and Allergies in Childhood (ISAAC). The risk of asthma was greater among active smokers than non-smokers. The group most affected by asthma

were the smokers with a history of smoking of more than 15 pack-years (OR = 2.37, 95% CI: 1.04–5.41), as compared with the non-smokers. When considering only the oldest age group (45+ years), asthma was found to be more prevalent in illiterate people (OR = 2.69, 95% CI: 1.17–6.15) and populations living in other urban areas (OR = 1.69, 95% CI: 1.05–2.70). The prevalence of childhood asthma (7.3%) is much lower than that of the developed countries like the UK (29%), Australia (30%), New Zealand (30%) and USA (21%) but similar to those of regional countries like Pakistan (8%) and India (7%). In general terms, higher prevalence rates have been found among children from 'westernized' countries than in developing countries in Asia and Africa. These differences may be real or may reflect study methodology. The children of Bangladesh are very prone to infections like measles, tuberculosis, and helminthes. The prevalence of measles in children under 5 years and below 9 months was found to be 1.5% and 17.8%, respectively. The prevalence of tuberculosis in the Bangladeshi population was 0.5% of the total population. The prevalence of geohelminths in school children (age 5–14 years) by stool microscopy showed *Ascaris lumbricoides* in 69%, *Trichuris trichura* in 39% and *Ankylostoma duodenale* in 8%. The infections of tuberculosis and measles are protective against the development of asthma. Helminthic infections also appear to protect against asthma.

Asthma was found to be more prevalent in children aged 5–14 years (7.3%) than in the adults of 15–44 years (5.3%) even after controlling for sex, household size, economic status and schooling. A similar finding was observed in Australia where asthma affects approximately one in five children and one in ten adults.

Children in small households (≤3) were more vulnerable to asthma. The explanation might be that respiratory infections are less likely to occur in these less crowded households as compared to larger households where respiratory infections are more prevalent. It is proposed that certain viral infections early in life may be protective against the development of allergic disease. Declining family size, improvements in household amenities and higher standards of personal cleanliness have reduced the opportunity for cross infection in young families. This may have resulted in more widespread clinical

expression of atopic disease. The prevalence of asthma was significantly higher in the less privileged social classes like the 'deficit' and illiterate groups within the population. These findings are in concordance with the studies conducted in New York City where rates of hospitalization because of asthma were generally higher in poor, unemployed and less educated residents.

Interestingly, our study shows that asthma is equally prevalent in metropolitan areas, in other urban areas and in rural areas. Though the city areas are highly polluted compared to rural and other areas, there is no definite basis that macroenvironmental factors such as climate and pollution are important determinants of regional variations of asthma severity. It is fashionable to ascribe the recent increase in the prevalence of asthma to atmospheric pollutants, such as nitrogen oxides, which have been implicated in the high prevalence of respiratory symptoms and asthma in western society. Pollution can undoubtedly trigger asthmatic attacks and be detrimental to lung function but the evidence regarding the role of pollutants in the development of asthma is much less convincing.

These factors are possibly important in causing variations over a short period of time. A German study also supports this view, as no significant difference was shown in the lifetime prevalence of wheeze in two areas differing in pollution levels.

The risk of asthma was greater among active smokers than non-smokers in this study. Cigarette smoking is a powerful risk factor for the development of chronic mucus hypersecretion and progressive airflow obstruction in middle and old age. The 4-year incidence of doctor diagnosed asthma among people aged 10–39 years in Tucson, Arizona, was three times greater among smokers than among non-smokers at the start of the observation period.

2.8.1 Burden of Asthma in Bangladesh: The first phase of ISAAC has been completed in 156 collaborating centres of 56 countries covering a population of 721 601 children. So far, only one study has been conducted to determine the prevalence of asthma in Bangladesh. It

was conducted on children in a coastal region and showed the prevalence of asthma to be 11.8%. Since the nationwide prevalence of asthma was not known, this study was undertaken to determine the prevalence and associated factors of asthma and wheeze in Bangladesh in all age groups. It was conducted under the joint auspices of Asthma Association and The Chest and Heart Association of Bangladesh with collaboration from government health authorities, local medical practitioners and field workers. This was a cross-sectional prevalence study, which quantified the distribution of asthma in the Bangladeshi population. This survey was conducted from January 1999 to August 1999. A multi-stage stratified random sampling design was followed. The whole country was stratified into three major strata: metropolitan, other urban and rural areas. The primary sampling unit (PSU) for the rural areas was village and that for urban areas was municipality block (mohalla). Data were collected from 14 metropolitan centres, 12 other urban centres and 12 rural centres. These centres were selected randomly. Twenty-five households for the metropolitan strata and 34 households for other urban and rural strata were selected randomly from each centre. On average, each household was considered to consist of five members. All members of the selected households were included in the survey. In each household, face-to-face interviews were performed with the housewives or other available people using a pre-tested structured questionnaire (prepared on the basis of studies of ECRHS,[3] ISAAC[4] and Usherwood *et al.*[7]) to collect data about all members of the household. Information regarding the household was recorded on the first page of the questionnaire; separate questionnaires were used for each individual member of the household. Children were defined as those aged 5–14 years, adults as people aged ≥15 years. Children aged <5 years were excluded from the study. Assessment of the economic status of the families was based on questions on family income and expenditure in the month preceding the interview. 'Surplus' meant that income exceeded the expenditure. This is the affluent group having an approximate monthly income >Tk15 000 (>US$300) per month. 'Balance' meant almost equal income and expenditure. This group comprises people with middle income having an approximate monthly income between ≤Tk15 000 and ≥Tk3000 (≤US$300 and ≥US$60) per month. 'Deficit' indicated when expenditure exceeded the income. This is the poor group having an approximate monthly income

<Tk3000 (<US$60) per month. Wheeze was defined as the whistling sound arising from the chest and not from the nose or throat. Asthma prevalence was defined as the prevalence of recent wheeze (in last 12 months). Ever wheeze was wheeze any time in the past. Doctor diagnosed asthma was the asthma diagnosed by any category of doctor (either qualified or quack). Perceived asthma was the perception of having asthma in adults by themselves or in children by the parents. Night cough was defined as cough at night in the absence of any chest infection or heart disease in last 12 months. 'Night cough, waking' was cough at night, which woke up the person, in the absence of any chest infection or heart disease in the last 12 months. The prevalence of asthma and its different categories were estimated with exact binomial 95% CI. The χ^2 test or χ^2 test for trend were used for the difference between proportions. Age-standardized prevalence rates were calculated for the populations of metropolitan, other urban and rural areas using direct method of standardization. Adjustment was made using the Bangladeshi population of 1991 as reference. Unadjusted odds ratio (OR) with 95% CI based on observed prevalence were calculated to compare the patients with asthma to subjects without asthma. Multiple logistic regression analysis was applied to adjust for confounding among risk factors and to determine the most influential factors on asthma prevalence. The adjusted OR was calculated with a model that included age, sex, household size, economic status, schooling and smoking behaviour. All analyses were performed using SPSS version 7.5 for Windows. A total of 963 families were studied covering 5642 people. The prevalence of recent wheeze (asthma) was 6.9% (95% CI : 6.2–7.6). The distribution of different categories of asthma definitions among children (5–14 years), adults (15–44 years) and all ages (5+ years) is shown. It demonstrates that the prevalence of asthma in childhood (5–14 years) was higher than that in adults (15–44 years) for all categories of asthma except night cough and 'night cough, waking' which were more prevalent in adults. The prevalence of asthma was similar in metropolitan areas 6.6% (95% CI: 5.5–7.8), other urban areas 7.8% (95% CI: 6.5–9.05) and rural areas 7.0% (95% CI: 5.7–8.0), when age was adjusted for. Younger children of 5–9 years and adults of 35–44 years were more likely to suffer from asthma than children aged 10–14 years or younger adults, respectively. Small households (<3 members) were found to be more vulnerable (OR = 2.20, 95% CI: 1.24–3.20) to childhood

asthma than larger households (>7 members). When considering all age groups, the 'deficit' group (OR = 1.41, 95% CI: 1.04–1.92) as well as the illiterate group (OR = 1.51, 95% CI: 1.01–2.24) were found to be more vulnerable to asthma attacks than the 'surplus' group and the more educated group, respectively.

This population-based study confirms that the prevalence of asthma in Bangladesh is high. The prevalence among children was found to be higher than among adults. Children under 5 years were excluded from the study. It seems likely that respiratory viral infections have an important part to play in the production of wheeze in young children. Asthma is also more prevalent in people belonging to lower socioeconomic groups and adult populations of lower educational status.

This nationwide study provided the first opportunity to examine reported asthma symptoms in children and the adult population of Bangladesh. A standard methodology including stratified random sampling covering the whole country was followed. The instrument used in the study has been adapted from the ECRSH[1], ISAAC[2] and Usherwood[3] questionnaires. Respiratory physicians were directly involved in the data collection process in the field.

In the stratification of economic status, there is no standard methodology for quick assessment in the community. We grouped the studied population on the basis of preceding month's income and expenditure into 'deficit', 'balanced' and 'surplus' groups. However, this method does not reflect the actual economic status of the family as perception of solvency varies among various strata of people.

Further studies need to be done to look into the details of risk factors and protective elements for the development of asthma in Bangladesh.

2.9 BANGLADESH SCENARIO:

Not that much data is available in Bangladesh and this is a basic pilot research.

In Bangladesh infant mortality rate is 5.7% and maternal mortality rate 3%. Top five causes and rate of infant and adult morbidity and mortality are given in Table.

The Expanded Program on Immunization (EPI) follows the international guidelines recommended by the WHO. The guidelines recommended that all children receive a Bacillus Calmette Guerin (BCG) – anti tuberculosis vaccination; three doses of Diphtheria. Poliomyelitis, Tetanus (DPT) vaccine and a vaccination against measles. WHO recommends that children receive all of these vaccines before their first birthday and that the vaccinations be recorded on a health card given to the parents.45 The percentage of children of 12-23 months is higher (62.2%-63.1%) at all levels than any other age groups and they get the immunization coverage of 83.3%.

Health Information

Health status data	1982	1999
Infant mortality rate	12.2%	5.7%
Maternal mortality rate	4.8 per 1000 live-birth	3%

Source: Statistical Year Book,1982 & 1999 Bangladesh Bureau of Statistics. Alauddin. 1986 (Health and Demographic Survey of BBS for 19950

Top five causes and rate of infant morbidity

	1999
Diarrhoea	6.56
Dysentery	4.31
Malaria	3.29
Malnutrition	2.39
Asthma	2.73

Source: Statistical Year Book, 1999 Bangladesh Bureau of Statistics

Top five causes and rate of infant mortality

	1999
Diarrhoea	18. 96
Tetanus	17.20
Pneumonia	12.75
Anemia	4.77
Measles	4.04

Source: Statistical Year Book, 1999 Bangladesh Bureau of Statistics

Top five causes and rate of adult morbidity

	1999
Fever/FOU	13. 30
Common cold	11. 62
Influenza	11. 37
Dysp/ Gast/ Peptic Ulcer	7. 77
	6. 56

Source: Statistical Year Book, 1999 Bangladesh Bureau of Statistics

Top five causes and rate of adult mortality

	1999
Diarrhea	11. 16
Heart disease	7. 87
Asthma	5.20
Tetanus	4. 98
Pneumonia	4. 47

Source: Statistical Year Book, 1999 Bangladesh Bureau of Statistic Health system data (as on 1999)

In Bangladesh total number of hospitals is 724. Total number of hospital bed is 25038. Person per hospital bed is 3736. Total number of registered physician is 11496. Person per physician is 8144. Household per physicians 1286.Total number of prescribers is 29618 both in Public and Private Sector. Total public health budget is US$ 297 million (BDT 16869 million). Private financing is the predominant funding mechanism in Bangladesh's health system. Private sector funding consists almost completely (near about 99%) of direct payment by households. The role of NGO financing is small (< 3% of total), as NGOs receive most of their funds from foreign and local donors. Total value of international aid for the health sector US$ 156 million (BDT 8861 million). Total health expenditure is US$ 994 million (BDT 56459 million) out of which US$ 646 million (about 65%) of total health expenditure is out of the pocket expenditure.

The expenditure on medical care has risen sharply throughout the world over the last thirty years. Health care costs have risen much faster than the increases reported in other sectors of the economy. Reduction of perinatal and childhood mortality, and improvements in nutrition, hygiene and medical care have dramatically increased the life expectancy and, therefore, the population of most countries are aging at an increasing rate. On the other hand, medical advances and new treatments have created continual demands on limited resources. Many individuals have limited access to adequate health care, and many countries are unable to provide it universally.

People living with chronic diseases like diabetes are especially facing an increasing demand for long-term continuous health care services and burden of health care cost. Thus in both developing and industrial countries, further increase in health care spending should be carefully planned. Many countries are now engaging in health care reforms designed to curtail the cost burden.

As a whole, health economics, economic analysis, study and research have become vitally important for making decisions and policies in health sector to ensure the optimum utilization of the limited resources.

After revising all the literature we find that different types of study have been done in different settings. Some are in low resource settings and some are in huge resource settings. Some of the study regarding cost and consequence of diabetes and asthma are well exposed in developed countries but almost absent in developing countries like ours. And very specifically regarding the cost-effectiveness of the management is totally absent in all settings. So it's a pioneer study in that regards and results may be helpful in many other health care programme.

METHODOLOGY

3. METHODOLOGY:

3.1 Method of data Collection:

Cross sectional study has been done which was analytical and retrospective in nature. The samples were divided into two groups. Primary data were collected from patients who were undergoing treatment for diabetic at the Out Patient Department of BIRDEM, and NHN, Dhaka & Asthma patient from The Asthma Centre. A total of 200 patients were selected purposively. Of them 100 were patients with type 2 diabetes and 100 were Asthma patients

Inclusion Criteria

Diabetes patients, minimum 2 years of duration, registered at BIRDEM or NHN
Chronic Asthma patients, minimum 2 years of duration, registered at Asthma Centre.
Age: above 30 yrs, Sex: both sex,

Exclusion Criteria:

Pregnancy, Any other illness, Mental disorders, Newly diagnosed cases.

A total of two hundred patients were taken as the sample of the study. Of them 100 were patients with diabetes and 100 were patients with asthma. Primary data were collected from BIRDEM Hospital and Asthma Centre. Secondary data were collected from the published records regarding the treatment and management of chronic diseases. Using the random sampling technique as per availability and accessibility the primary data were collected. The main variables are degree and extent of complications, treatment outcome, clinical effectiveness, functional level, consumer's out of pocket expense, indirect cost of consumer, disease burden, economic cost. Data analysis procedure were managed by the appropriate statistical technique. Disease burden were calculated through DALY method, cost were calculated considering all the inputs as well as opportunity cost forgone, cost of interviewers were calculated using the average cost incurred per patients in or diabetes and asthma centre as well as associated cost incurred in the house. Attempts would also be made to identify the factor which causes high cost-effective of intervention, using different multivariate analysis. A detailed history of disease onset & the illness were taken from the patient's

diabetic guide book, thorough general examination were carried out, findings of the performed investigations were recorded, in light of the study protocol. Relevant associated medical conditions were recorded carefully. Treatment findings and peri-intervention complications were recorded and noted. Patients' status was re-examined and recorded. All these information were also recorded in a case abstract sheet that were used for further recording during follow-up visits. Data were collected from the abstract sheet in a pre-tested checklist.

Collected data were managed by the following steps: Collected data were corrected and edited manually, then the collected data were entered into a SPSS (statistical package for social scientists) computer software program, the entered data were checked and verified, the same program will analyze the data, data were presented in tabular (univariate, bivariate and multivariate tables) and in different graphical presentations, statistical calculations such as mean, standard deviations and appropriate statistical tests were performed by SPSS computer program.

3.2 Method of analysis

Tabular and graphical presentation, multivariate analysis, differential analysis, econometric analysis: operational model, scientific method of estimation etc.

3.2.1 Costs:

Unit costs of patients were measured from the questionnaire and from the market value. For example, the daily cost in hospital by specialty can be an average of the standardized financial returns of up to other hospitals across Bangladesh. Then summarize the main sources of information on unit costs. After that combine these unit costs with the resource volumes to obtain a net cost per patient over the entire period of participation in the trial. Again calculate mean net costs and associated 95% confidence intervals per patient for each arm of the study. Costs were reported both undiscounted and in net present values by means of the 6% annual discount rate approved by the World Bank and a 3% annual discount rate as recommended by the United States Panel on Cost-Effectiveness. *(Gold M, Siegel J, Russell L, Weinstein M.* Cost-effectiveness in health and medicine. Oxford: Oxford University Press, 1996). Discounting would convert future costs and effects to present values, reflecting the

conventional view that individuals put a higher value on resources used today than at some point in the future. All costs will be reported in 2006 values of Taka and US$.

Among the cost components direct and indirect cost has been calculated for total patients. The total cost for both the groups was to be found for the cost effectiveness ratio. Cost per patients has been calculated by the following formula.

$$\text{Cost per patients} = \frac{\text{Total cost of the patients}}{\text{Total no of the patients}}$$

The average cost per patients for both the groups would calculated by the same formula.

For the effectiveness data EuroQoL has been used to identify the effects of these two types of treatment and management variations. The following methods was used to find out the health condition and health status improvement –

3.2.2 EuroQoL Classification System

Mobility

No problem in walking

Some problem in walking about

Confined to bed

Self-care

No problems with self-care

Some problems with washing or dressing itself

Unable to wash or dress self

Usual activities

No problems with performing usual activities

Some problems with performing usual activities

Unable to perform usual activities

Pain/discomfort

No pain/discomfort

Moderate pain/discomfort

Extreme pain/discomfort

Anxiety/depression

Not anxious/depressed

Moderately anxious/depressed

Extremely anxious/depressed

(Dolan, Gudex, Kind and Williams 1995, Figure 1. MF Drummond, BJ O'Brien, GL Stoddart, GW Torrance. Methods for economic evaluation of health care programmes. Second Edition, Oxford University Press 1997: pp 163)

EuroQoL scoring formula

Coefficient for TTO tariffs

Dimension	**Coefficient**
Constant	0.081
Mobility	
No problem in walking (level 1)	0
Some problem in walking about (level 2)	0.069
Confined to bed (level 3)	0.314
Self-care	
No problems with self-care (level 1)	0
Some problems with washing or dressing itself (level 2)	0.104
Unable to wash or dress self (level 3)	0.214
Usual activities	
No problems with performing usual activities (level 1)	0
Some problems with performing usual activities (level 2)	0.036
Unable to perform usual activities (level 3)	0.094
Pain/discomfort	
No pain/discomfort (level 1)	0
Moderate pain/discomfort (level 2)	0.123
Extreme pain/discomfort (level 3)	0.386

Anxiety/depression	
Not anxious/depressed (level 1)	0
Moderately anxious/depressed (level 2)	0.071
Extremely anxious/depressed (level 3)	0.236
Full health	1.000
Constant term (for any dysfunctional state)	0.081
N3 (The term N3 is used to identify if any dimension is level 3)	0.269

The cost effectiveness analysis was done for the expected result. The analysis, in which costs are related to a single, common effect which may differ in magnitude between the alternative programmes, are usually referred as cost-effective analysis. The results may be express as either in terms of cost per unit of effect or effects per unit of cost. The first expression has been chosen for our study that is dollar spent per life year gain. For uncontrolled and ill-management group the total cost has been divided by the total effects that are health condition or health status improvement through EuroQol, in the same way for the other group the cost per effect has been intended. The ratio was found by the following formula –

$$\text{Cost effective ratio} = \frac{\text{Cost of diabetes group}}{\text{Effects of diabetes group}} \Big/ \frac{\text{Cost of asthma group}}{\text{Effects of asthma group}}$$

The incremental cost effective ratio could be done by using the same formula but the cost and effects per patients has to be calculated.

In the last two decades, considerable international effort has gone into the development of summary measures of population health that integrate information of mortality and non-fatal health outcomes. The interest in such measures stems from their usefulness to compare the health of populations, to monitor trends over time, to measure the total magnitude of health problems using a common currency (and one that can also be used for cost-effectiveness analyses), to ensure non-fatal health outcomes receive appropriate attention and to measure the population-wide benefits of health interventions.

Two major types of summary measure have been developed: health expectancies (disability-free life expectancy (DFLE), active life expectancy etc) and health gaps (disability-adjusted life years, healthy life years etc). Health expectancies have been widely adopted for monitoring progress in health at national and international level. Disability-adjusted life years (DALYs) have been used to estimate the global burden of disease to guide World Bank investment policies for health, to inform global priorities for health research and have been taken up by WHO to measure the global burden of disease in the year 2000.

An important goal in constructing summary measures, and one that may explain the increasing attention to summary measures, is to identify the relative magnitude or *burden* of different health problems, including diseases, injuries and risk factors. This paper reviews and compares health expectancy and health gaps approaches to the estimation of burden of disease.

DALYs combine losses from premature death (defined as the difference between the actual age of death and life expectancy at that age in a low-mortality population), and loss of healthy life resulting from disability. In simple terms, a DALY strives to tally the complete burden that a particular disease exacts. Key elements to consider include the age at which disease or disability occurs, how long its effects linger, and its impact on quality of life. Losing one's sight at age 7, for instance, is a greater loss than losing one's sight at 67. Similarly, a bout of acute illness that is over quickly counts less in the DALY calculation than one that leaves lingering weakness, such as persistent worm infections.

This new indicator can be used in different ways to compute the total burden of a particular disease, such as malaria (which accounts for some 65,578,000 DALYs per year), or to tally up the total global burden of disease (in 1990 the world's population lost 2,480,237,000 DALYs), or to compare the relative burden of disease among different regions of the world [Christopher J. L. Murray and Alan D. Lopez, eds, *The Global Burden of Disease: Volume 1* (World Health Organization, Harvard School of Public Health, and The World Bank, Geneva, 1996), p. 609.].

From this perspective which considers not just premature death but disability as well as the huge toll of ill health in developing countries stands out even more starkly. Nearly nine tenths of the global burden of disease occurs in developing regions where only 1 in 10 health care dollars are spent [Christopher J. L. Murray and Alan D. Lopez, eds, *The Global Burden of Disease: Volume 1* (World Health Organization, Harvard School of Public Health, and The World Bank, Geneva, 1996), p. 254]. As the Disproportionate Disease Burden in Africa shows, sub-Saharan Africa suffers twice the burden of ill health as the global average and nearly five times more than the richest countries.

Using this new metric, communicable diseases are the single most important cause of ill health globally, accounting for 44 percent of the total. (Deaths versus DALYs compares the 10 leading causes of death with the 10 leading causes of DALYs) This increase in the relative importance of infectious diseases reflects in large part the early age at which they strike. Of the top 10 causes of DALYs globally, communicable diseases account for 7, with lower respiratory infections and diarroheal diseases heading the list. DALYs also underscore the disproportionate burden of ill health borne by the world's children. Children under age 15 account for almost one half of all lost DALYs worldwide. As the following discussion makes clear, the diseases that most affect children tend to be heavily influenced by environmental factors.

3.2.3 Disease Burden will be calculated as follows-

The burden for people living with a condition (the morbidity burden) is described in terms of Years of Healthy Life Lost to Disability, or YLDs. Disability in this context refers to any departure from a state of perfect health, not just the group of conditions traditionally included under the heading of "disabilities".

As a year with less than perfect health is considered to contribute less to the disease burden than a year lost to premature mortality, YLDs are weighted according to the severity of the condition. Each condition has a severity weighting in the range 0 to 1 with 1 being the most severe. For example, the common cold has a severity weight of 0.014, whereas end stage cancer has a severity weight of 0.93. YLDs are calculated according to the formula YLD = I*SW*L where

I = the number of incident cases of the condition in South Australia in 2000
SW = the severity weight of the condition and
L = the average duration (in years) of the condition
For example, 10 incident cases of a disease with a severity weighting of 0.5 that lasts on average for 2 years would result in 10*0.5*2 = 10 YLDs.
The burden of disease due to premature death (the mortality burden) is described in terms of Years of Life Lost or YLLs. For example, if someone dies from a condition at 50, and the average life expectancy at 50 is 32 years, then this death contributes 32 YLLs to the burden of that disease.
YLLs are calculated according to the formula YLL = N*L where
N = the number of deaths and
L= the average life expectancy at age of death
Overall disease burden, taking into account both people living with a condition and people dying from a condition, is described in terms of Disability Adjusted Life Years or DALYs.
One DALY represents one lost year of 'healthy' life. DALYs are simply the sum of years of life lost due to premature mortality YLL and the equivalent 'healthy' years of life lost due to disability YLD.
DALYs are calculated according to the formula DALY = YLL + YLD
For example, if asthma has a morbidity burden of 4121 YLDs and a mortality burden of 398 YLLs, then the overall disease burden of asthma will be 4121 + 398 = 4522 DALYs.

To measure the state of health of a population and, together with the related concept of cost-effectiveness, to judge which interventions to improve health deserve the highest priority for public action, "Investing in Health" makes extensive use of the concept of the Disability-Adjusted Life Year (DALY). The DALY has emerged as a measure of the burden of disease and it reflects the total amount of healthy life lost, to all causes, whether from premature mortality or from some degree of disability during a period of time. These disabilities can be physical or mental. The intended use of the DALY is to assist (i) in setting health service priorities; (ii) in identifying disadvantaged groups and targeting of health interventions; and (iii) in providing a comparable measure of output for intervention, program and sector evaluation and planning.

The number of DALYs estimated at any moment reflect the amount of health care already being provided to the population, as well as the effects of all other actions which protect or damage health. Where treatment is possible--whether preventive, curative or palliative--the effectiveness of the intervention is the reduction in disease burden which the treatment produces. Effectiveness is measured in the same units (DALYs) as disease burden, and so can be compared across interventions which treat different problems and produce different outcomes. In other words, the DALY can be used to measure the gains in health attributable to different actions and add them up.

The proponents of the DALY use this measure for two purposes: (i) to measure the burden of disease, and (ii) to increase the allocative efficiency of the sector by identifying health interventions that, for a given budget, will purchase the largest improvement in health, as measured by the burden of disease indicator (DALY).

Values Incorporated in the DALY Indicator

The five key social preferences or values that are incorporated into the indicator of burden of disease "DALY" are the following:

Duration of time lost due to a death at each age, which is used to measure years of life lost due to premature mortality (or the number of years of life gained by averting death). This measurement requires defining the potential limit of life; in the case of DALYs, standard years of life lost are used. The standard has been chosen to match the highest national life expectancy observed, which was that of Japanese women (82 years). For a specific standard, the expectations are based on model life-table West Level 26, which has a life expectancy at birth for females of 82.5. The potential life expectancy at birth for males has been set at 80.

Disability weights or degrees of incapacity or suffering associated with different non-fatal conditions, which are necessary to make comparisons across diseases, as well as for comparing time lived with a disability with time lost due to premature mortality. Six disability classes measuring the extent of loss of physical functioning associated with a certain condition were defined. Subsequently, a group of independent experts

established a weight, ranging from 0 (perfect health) to 1 (death), for each of the six disability classes.

Age-weights, which indicate the relative importance of healthy life at different ages. The age weights used in the World Bank report rise from birth until age 25 and decline slowly thereafter. According to the World Health Organization (1994), the formula to calculate those weights is:

Where:

C = Constant equal to 0.16243.

ß = Constant equal to 0.04.

x = Age. e = Constant equal to 2.71

Time preference, which is the value of health gains today compared to the value attached to health gains in the future (in standard economic theory, the latter is assumed to be lower than the former). It is standard practice in economic appraisal of projects to use the discount rate to discount benefits in the future. The process of discounting future benefits converts them into net present-value terms; these benefits can then be compared with project costs (also discounted if they are spread over more than one year) to determine cost-effectiveness.

The discount rate used in the DALY formula is 3 percent. The formula to discount for time preferences:

Where:

r = Discount rate, fixed at 0.03

x = Age.

e= Constant equal to 2.71

a = Onset year.

Health is simply added across individuals. That is, two people each losing 10 years of disability-free life are treated as the same loss as one person losing 20 years. One could also weight duration non-linearly, so as to give priority to fewer people suffering for long intervals over more people suffering for shorter intervals.

In summary, the disability-adjusted life year is an indicator of the time lived with a disability and the time lost due to premature mortality. The duration of time lost due to premature mortality is calculated using standard expected years of life lost with model life-tables. The reduction in physical capacity due to morbidity is measured using disability weights. The value of time lived at different ages has been calculated using an exponential function which reflects the dependence of the young and the elderly on the adults. Streams of time have been discounted at 3 percent. Accordingly the number of DALYs lost due to disability at age "x" can be calculated using the following formula:

If the person lives up to the maximum of his life expectancy with disability, we need to add up the total number of DALYs lost from the onset of disability (a) to the age of death (a+L). The following formula can be used:

Where:

L = Years of life left at age "a"

D = Disability weight (ranging from 1 death to 0 for perfect health).

Procedure to Calculate DALYs

The following examples illustrate how the formula to calculate DALYs is applied. This section is based on the examples presented in the manual "Selecting an Essential Packages of Health Services Using Cost-Effectiveness Analysis" (Data for Decision Making, 1993: pages 16 - 20). Taking into account that each health problem results in four possible outcomes (death, disability before death, permanent disability, or full recovery), we will calculate the number of DALYs lost for each one of these four scenarios.

We will represent each outcome in an hypothetical life horizon between the onset of disease and the resulting health outcome. The axis indicates the number of years an individual is expected to live.

The example corresponds to a female child who contracts poliomyelitis at age five. As a result she can die; she can live for a period of 5 years and then die; she can be permanently disabled; or she can recover after a period of disability. Lets assume that

the horizon of life (total) is 82.95 years, when she got sick at 5 she still had 77.95 years of life left. We will assume that the disability weight in her case is 0.5.

CASE 1: DALYS LOST DUE TO IMMEDIATE DEATH.

The horizon for this case is:

We have the following information:

C = 0.16243.

D = 1 (This is because the person dies, in case of disability it is 0.5).

r = 0.03 (Discount rate of 3 percent).

ß = 0.04 (Value fixed by experts, see World Health Organization, 1994).

a = 5 (Year of death).

L = 77.95 (Remaining years of life. It is equal to 82.95 years minus 5 years).

e = 2.71.

Replacing in the DALY formula the above values we have:

The number of DALYs lost to premature mortality is equal to 35.85.

CASE 2: DALYS LOST DUE TO DEATH FOLLOWING DISABILITY.

The horizon for this case is:

In this case we have to calculate the number of DALYs lost due to disability and the number of DALYs lost due to premature mortality. To calculate the number of DALYs lost due to disability we have the following information:

C = 0.16243.

D = 0.5

r = 0.03 (Discount rate of 3 percent).

ß = 0.04

a = 5 (Year when the disability starts).

L = 5 (Years with the disability).

e = 2.71.

Then the number DALYs lost due to disability is 2.0.

To account for the number of DALYs lost due to premature death (72.95 yrs.), we have the following information:

C = 0.16243.

D = 1.

r = 0.03

ß = 0.04

a = 10 (Year when the person dies).

L = 72.95 (Potential years of life left at time of death).

e = 2.71.

The number of DALYs lost due to premature death are 36.85 years. Here there is an important point to take into account. Those 36.85 years are the DALYs calculated at the age of 10; to add them up with the DALYs lost due to disability calculated at age of onset (5 years), we have to convert the 36.85 DALYs calculated at age 10 to their value at the age of onset of the disease, that is at age 5. This can be done using the following formula:

The variables in the formula have been defined previously, except for "s" which is the number of years we have to discount (age of 10 minus age of 5). Applying the formula we have:

That is, at the time of the onset of the disease (5), the number of DALYs lost due to premature mortality at age 10 equals the number of DALYs lost at age 10 (36.85) times 0.86, which is 31.7 years.

In summary, the total number of DALYs lost due to a period of disability followed by death equals the number of DALYs lost to disability (ii) plus the number of DALYs lost to premature death (31.7), that is 33.7 DALYs.

CASE 3: DALYS LOST DUE TO PERMANENT DISABILITY.

The horizon for this case is:

We have the following information:

C = 0.16243.

D = 0.5

r = 0.03 (Discount rate of 3 percent).

ß = 0.04

a = 5 (Year of onset).

L = 77.95 (Remaining years of life. It is equal to 82.95 years minus 5 years).

e = 2.71.

Replacing in the formula the above values we have:

The total number of DALYs lost due to permanent disability equals to 17.92.

CASE 4: DALYS LOST DUE TO DISABILITY FOLLOWED BY COMPLETE RECOVERY.

The horizon for this case is:

We have the following data:

C = 0.16243.

D = 0.5

r = 0.03

ß = 0.04

a = 5.

L = 5 (number of years with disability).

e = 2.71.

Replacing the above values in the DALY formula we have:

The number of DALYs lost to disability equal to 2.0 years.

RESULTS

4. RESULTS OF THE EMPIRICAL STUDY ON BURDEN OF DIABETES AND ASTHMA

4.1 Component wise Distribution:

Among the 100 diabetic patients with type 2 diabetes and 100 patients with asthma has been taken as the study subjects. A comparison was made between these two groups.

The degree and extent of complications, treatment outcome, clinical effectiveness, functional level, consumer's out of pocket expense and indirect cost of consumers were calculated. Incremental cost-effectiveness analysis has been calculated for patients (mean age 52 years) with type 2 diabetes and patients with asthma.

Table 1: Distribution of subjects (by age)

	Disease	Asthma	Diabetes
Age	<30	9.4%	5.3%
	30-40	5%	2.8%
	40-50	63.33%	57.1%
	50-60	12.27%	7.3%
	>60	10%	27.5%

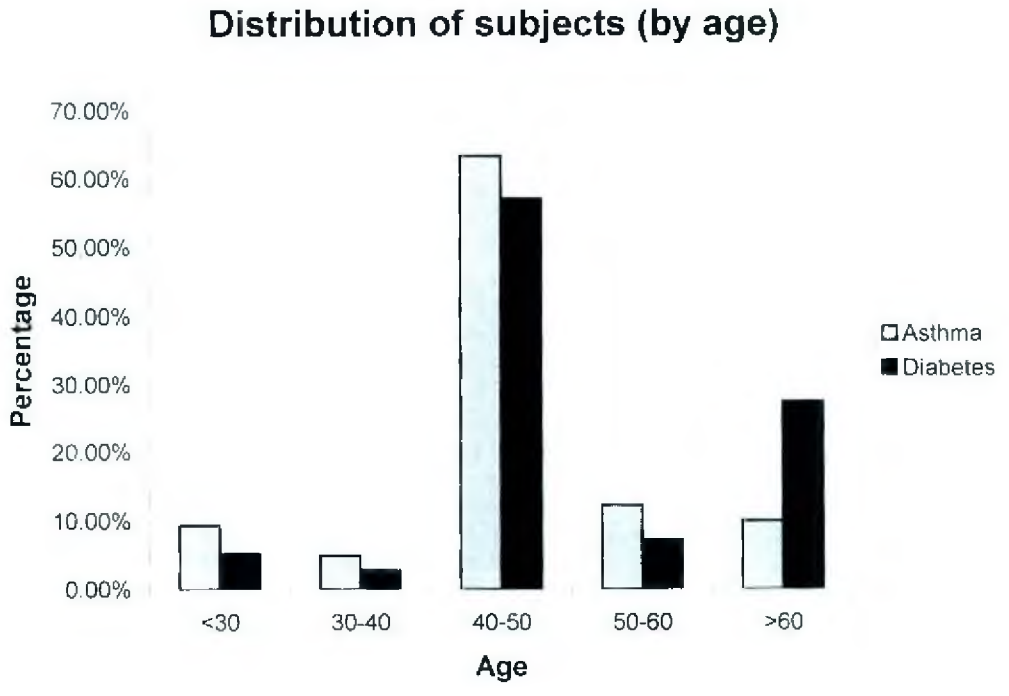


Figure 1: Distribution of subjects (by age)

Of the 100 diabetic subjects females constituted around 41% of the study subject and the rest is male. On the contrary among the asthma patients females constituted around 28% of the whole. Male has a very significant contribution in the asthma study subjects. It has been shown that both in diabetes and asthma among the age group 40-50 constitute most of the study subjects. At this age the level of physical activity is much more lower, the pattern of work is totally different and seating based, rapid urbanization, modified dietary pattern are the cause as such problem.

Table 2: Distribution of subjects (by Sex)

	Disease	Asthma	Diabetes
Sex	Male	59%	72%
	Female	41 %	28%

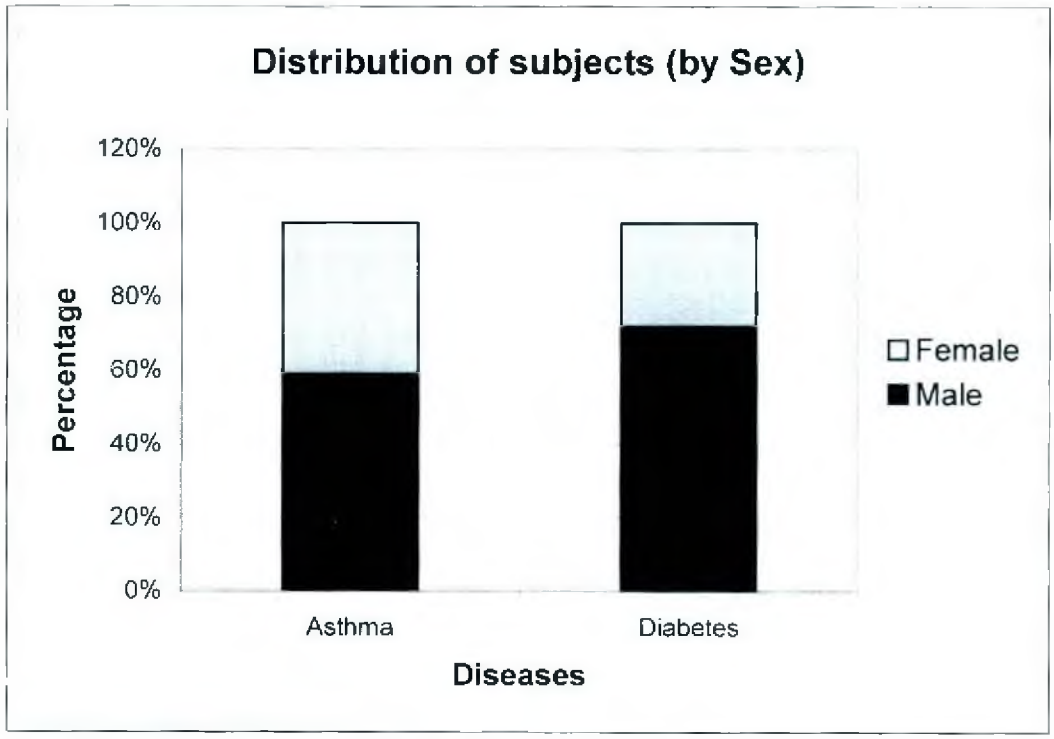


Figure 2: Distribution of subjects (by Sex)

Among the both disease male constitute most of the samples. The response from the male is more appreciable. The female candidates are less responsive towards the health awareness. As they get less time due to household work so they come to the center very rarely unless and until they get severe complication.

Table 3: Distribution of subjects (by Literacy)

	Disease	Asthma	Diabetes
Literacy	Illiterate	26%	19%
	Literate	59%	71%
	Graduate	15%	10%

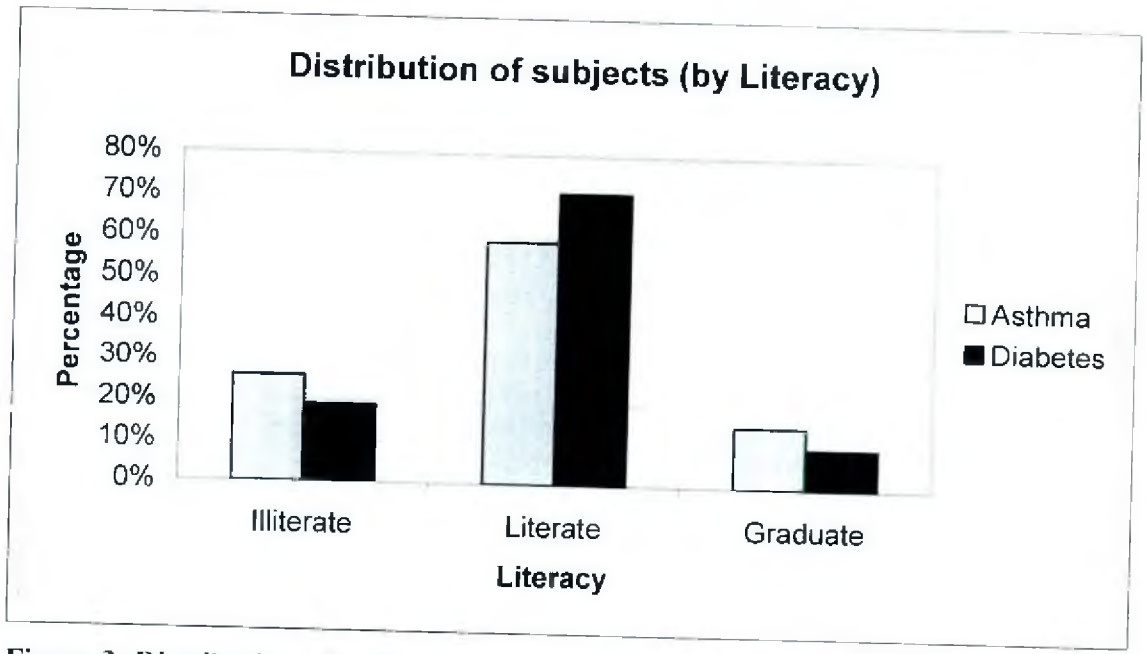


Figure 3: Distribution of subjects (by Literacy)

The rate of literacy overall was 59% and 71% respectively, the status of education is above Higher Secondary Level to be satisfactory for our study. There might be due to as the national literacy rate is lower than many other developing countries like India, Sri Lanka and many others.

Table 4: Distribution of subjects (by Socio-economic class)

	Disease	Asthma	Diabetes
Socioeconomic Class	> 500	2%	2%
	1000 -2000	4%	7%
	2000-3000	7%	13%
	Poor	13%	22%
	3000-5000	33%	23%
	5000 -7000	19%	18%
	7000-10000	11%	7%
	Middle	63%	47%
	10000>	24%	31%
	Rich	24%	31%

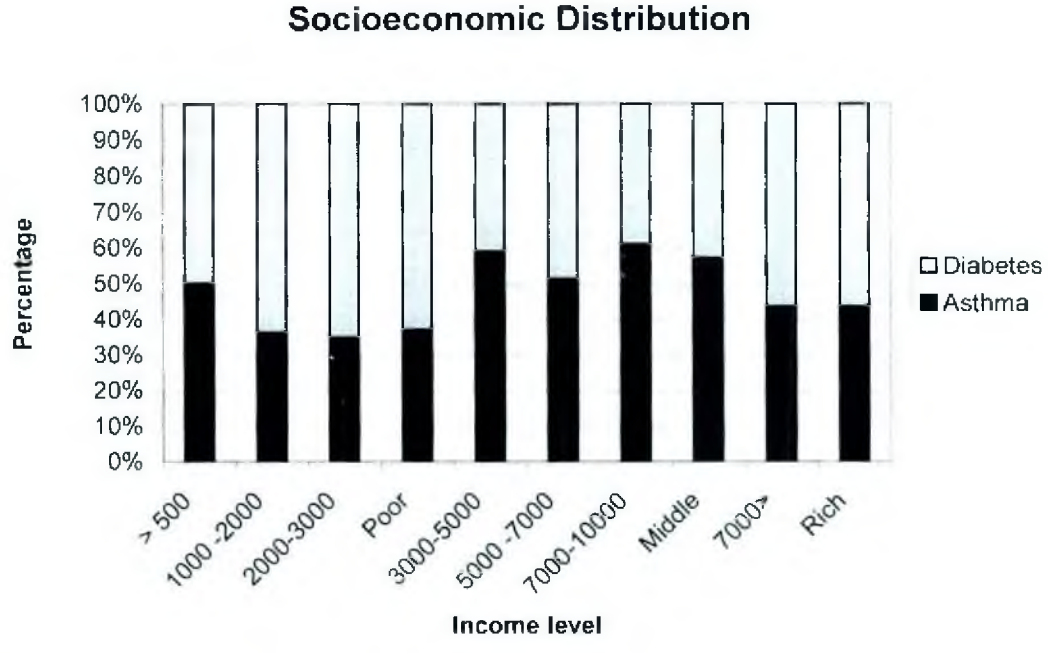


Figure 4: Distribution of subjects (by Socio-economic class)

Socioeconomic level shows that middle class family is much responsive to the health awareness. Might be rich class are not like to come as such public center. The health awareness among the poor class is very low due to willingness to pay and as well as ability to pay.

Table 5: Distribution of subjects (by demographic variation)

	Disease	Asthma	Diabetes
Demographic	Rural	14%	12%
	Sub-Urban	41 %	38%
	Urban	45%	50%

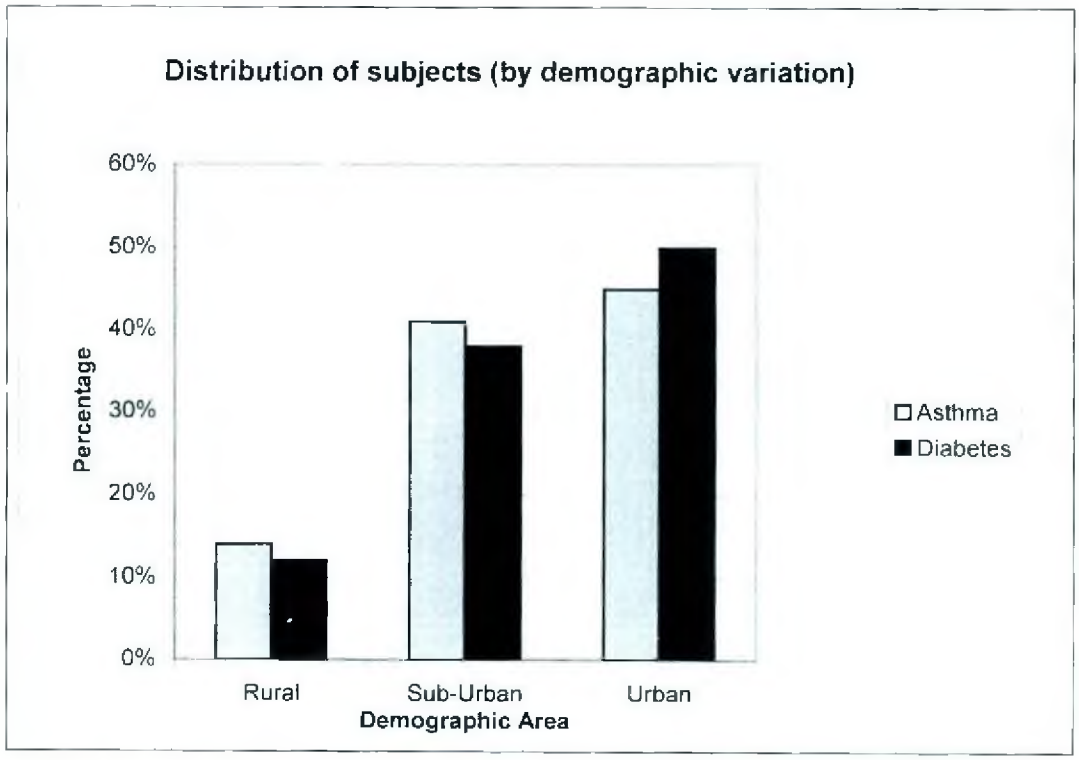


Figure 5: Distribution of subjects (by demographic variation)

The demographic distribution shows that the disease prevalence is more higher at urban area rather than sub-urban and rural area because life style modification, rapid

urbanization and modified dietary habit increase the prevalence of the diseases. One interesting findings is that in both cases the urban people are suffering more.

Table 6: Distribution of patients (by occupation status)

Occupation	Asthma	Diabetes
Landowner	25%	17%
Service holder	52%	59%
Businessman	15%	13%
Dependent (housewife $ unemployed)	8%.	11%

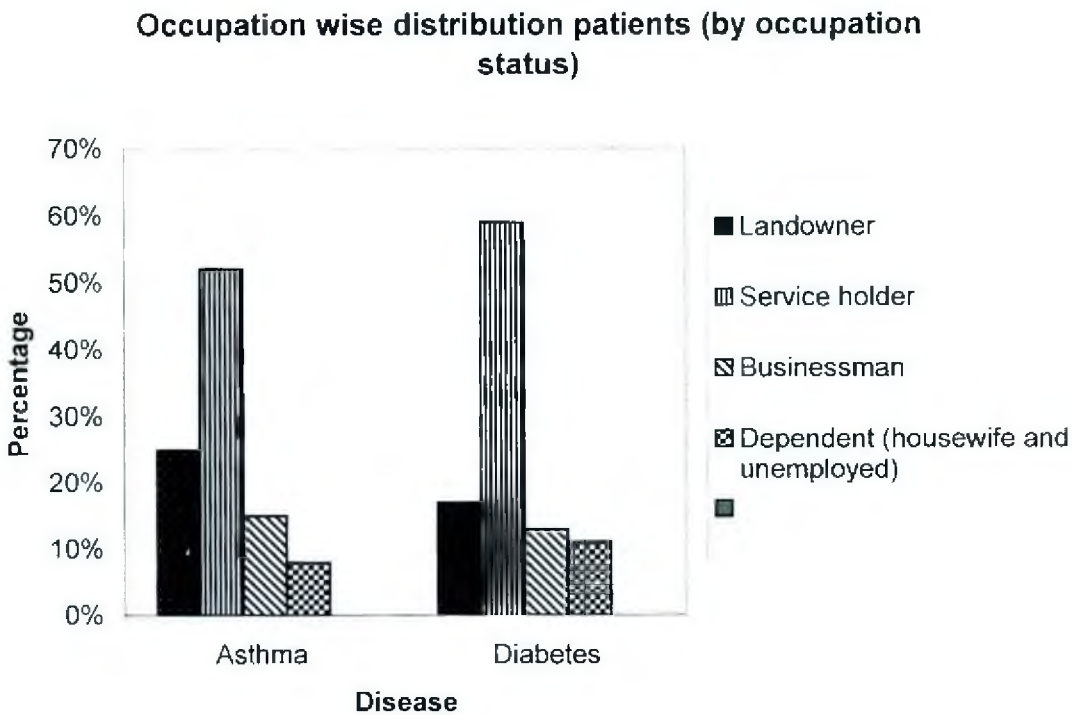


Figure 6: Occupation wise distribution patients (by occupation status)

Regarding occupation landowner makes 25% & 17%, service holder 52% & 59%, businessman 15% & 13% and dependent (housewife and unemployed) 8% & 11% respectfully in case of Asthma and Diabetes.

Table 7: Distribution of patients (by Physical Activity Level)

Physical Activity Level	Asthma	Diabetes
Mild	51%	47%
Moderate	32%	20%
Heavy	17%	13%

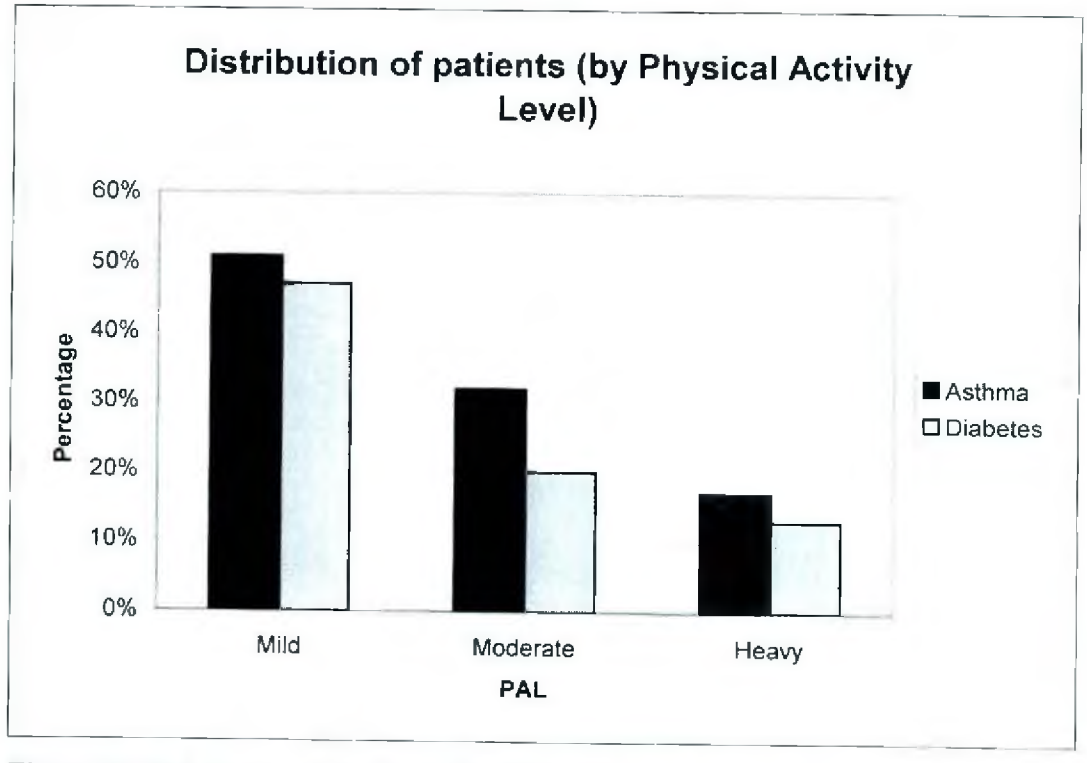
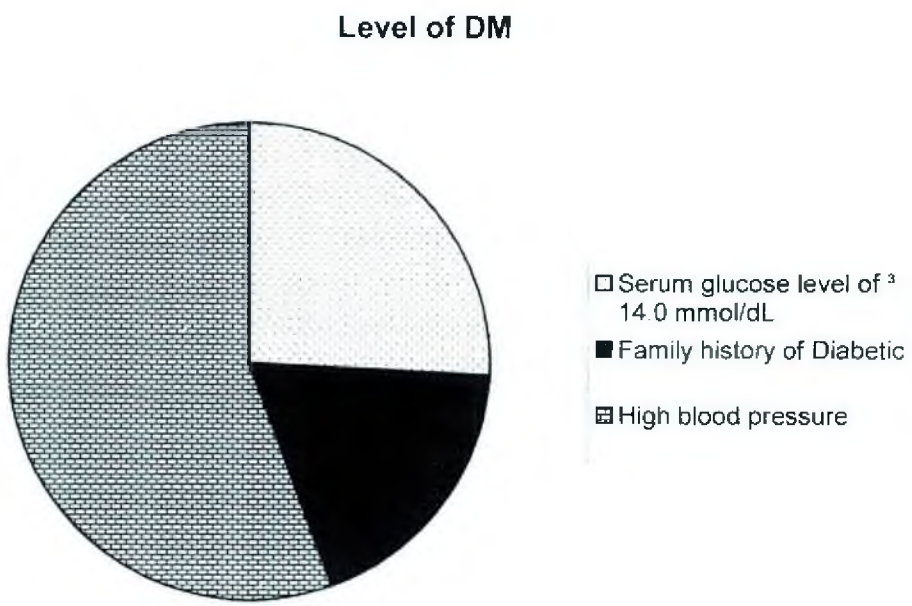


Figure 7: Distribution of patients (by Physical Activity Level)

Physical activity level (PAL) shows 51% & 47% are involve with mild activity, 32% and 20% with moderate and 17% % 13% with Heavy activity respectfully. Because of this type of low activity peoples get obese and get this type of complication very frequently. And it is increasing at an alarming rate.

Table 8: Distribution of Level of disease pattern

Diabetic Patients	
Serum glucose level of ≥ 14.0 mmol/dL	20% of women and 22% of men
Family history of Diabetic	15%
High blood pressure	45%
Asthma Patients	
Severe	17%
Moderate	30%
Mild	53%



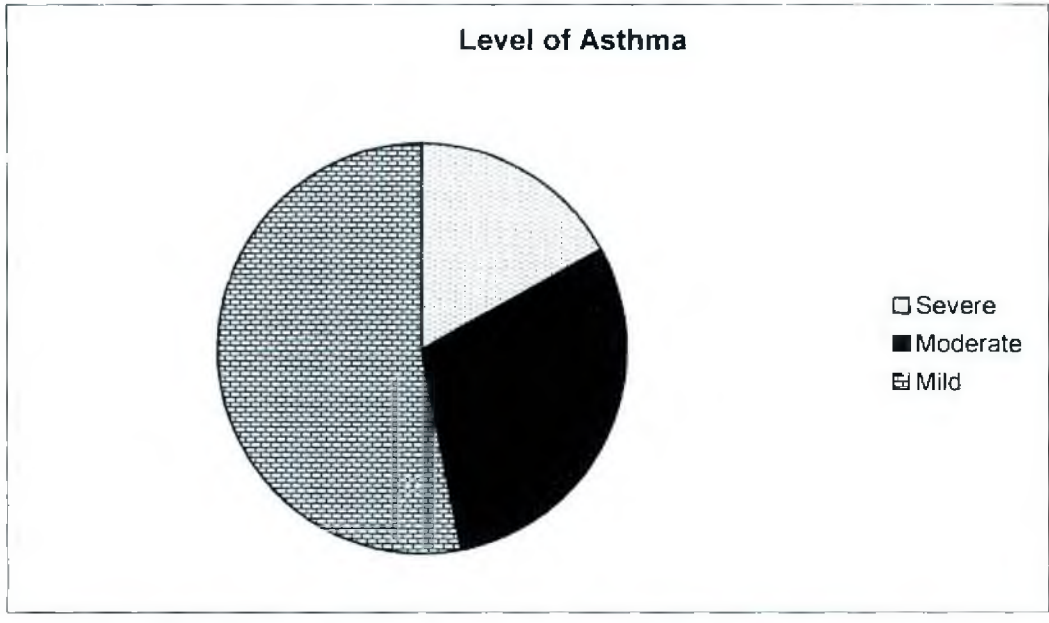


Figure 8: Distribution of Level of disease pattern (By complication wise)

Family history of diabetes was present in only 15% Cases and of large sample. Serum glucose level ≥ 14.0 mmol/dL has been shown with 20% of men and 22% of women. On the contrary it has been shown that only 17% of the study subjects have been suffering from severe asthma, 30% of moderate asthma and 53% of mild asthma. So it is obvious that the burden is more higher in case of diabetes than that of asthma.

Females had a significantly higher body mass index than males (30.9 vs. 29, $P < 0.002$), but lower levels of physical activities. Oral hypertensive & hypoglycemic medications (both) were taken by 50% of women and 22% of men. Only 9 (15%) of subjects reported a family history of Diabetic hypertensive, while 27 (45%) of hypertension with high blood pressure. Of those subjects known to be hypertensive patients with type 2 diabetes 15 (25%) had a serum glucose level of ≥ 14.0 mmol/dL.

Table 9: Distribution of samples (by development of complications)

Diabetes Complications	%
Nephropathy	58.33%
Retinopathy	23.33%
Neuropathy	16.66%
Asthma Complications	
Bronchiolitis	11%
Mold allergies	13%
Whooping Cough	16%

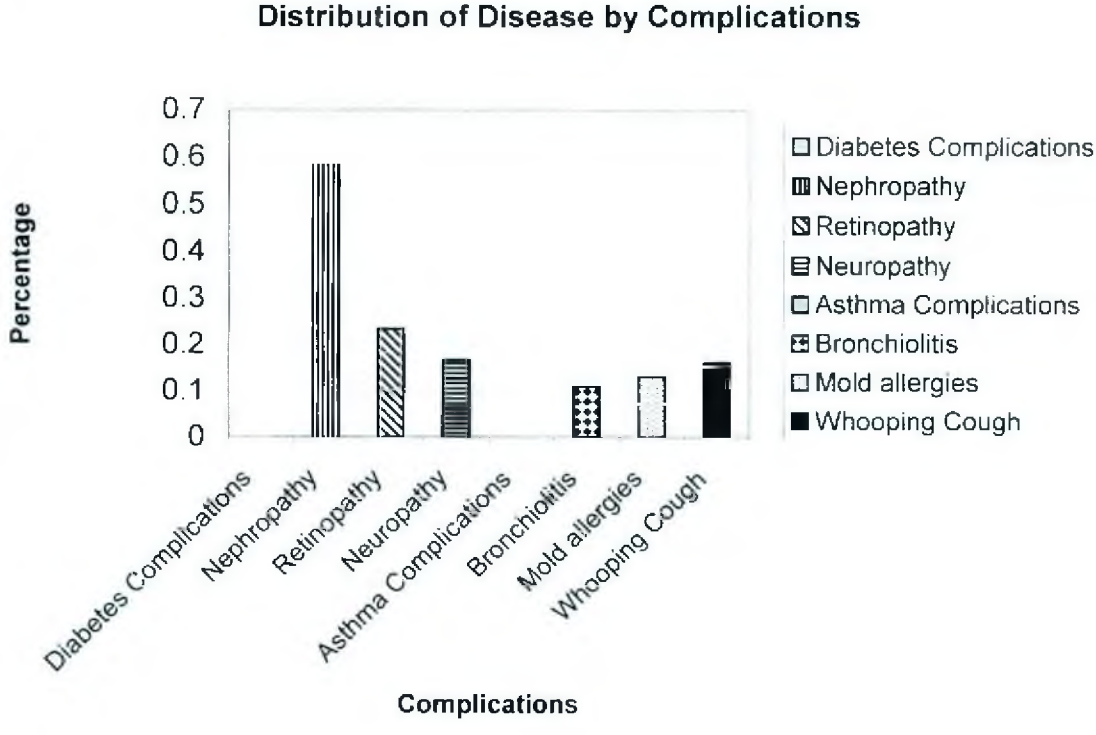


Figure 9: Distribution of samples (by development of complications)

There must be a cost burden due to complication and it has been shown that it is more higher in case of diabetes rather than asthma. Among the diabetes patients is 58.33% suffering from nephropathy complication. 23.33% of retinopathy complication. 16.66% of neuropathy complication. On the other hand among the asthma patients only 11% is suffering from Bronchiolitis, 13% from mold allergies and 16% from Whooping cough.

The tangible and intangible costs of diabetes to the individual and the community have been difficult to establish. Due to the difficulties associated with gaining accurate figures. the cost of diabetes has always been extrapolated from national figures. Significant health resources are expended nationally on treating all forms of diabetes.

4.2 Cost Distribution

Table 10: Cost components (Direct)

Cost	**Diabetes**		**Asthma**	
Direct cost	Amount in US$	%	Amount in US$	%
Medical advice	921.00	8.91	935.20	7.03
Specialized Care	978.23	9.46	1023.56	7.69
Investigations	1987.32	19.22	2304.52	17.32
Drugs	957.66	9.26	1954.53	14.69
Medical & other treatment	1531.11	14.81	2341.71	17.60
Food cost	756.11	7.31	856.47	6.44
Hospitalization	1425.12	13.78	1824.75	13.71
Medical Stuff/hrs	998.24	9.65	1104.12	8.30
Nursing Stuff/hrs	786.65	7.61	963.42	10.52
Direct cost	**10341.44**	**59.78**	**13308.28**	**59.23**

Table 11: Cost components (Indirect)

Cost	Asthma		Diabetes	
Indirect cost	US$	%	US$	%
Travel cost	1454.87	20.91	1978.54	21.60
Cost of productivity loss	1748.41	25.13	2310.11	10.28
Cost of accompanying person(s)	1854.86	26.65	2487.84	27.16
Children deprivation cost	874.43	12.57	914.12	9.98
Housewife services cost	478.34	6.87	854.17	9.33
Waiting time loss cost	547.87	7.87	614.71	6.71
Indirect cost	**6958.78**	**40.22**	**9159.49**	**40.77**

Table 12: Cost components (Direct, Indirect & Total)

Cost	**Asthma**		**Diabetes**	
Direct cost	10341.44	59.78	13308.28	59.23
Indirect cost	6958.78	40.22	9159.49	40.77
Total	17300.22	100.00	22467.77	100.00

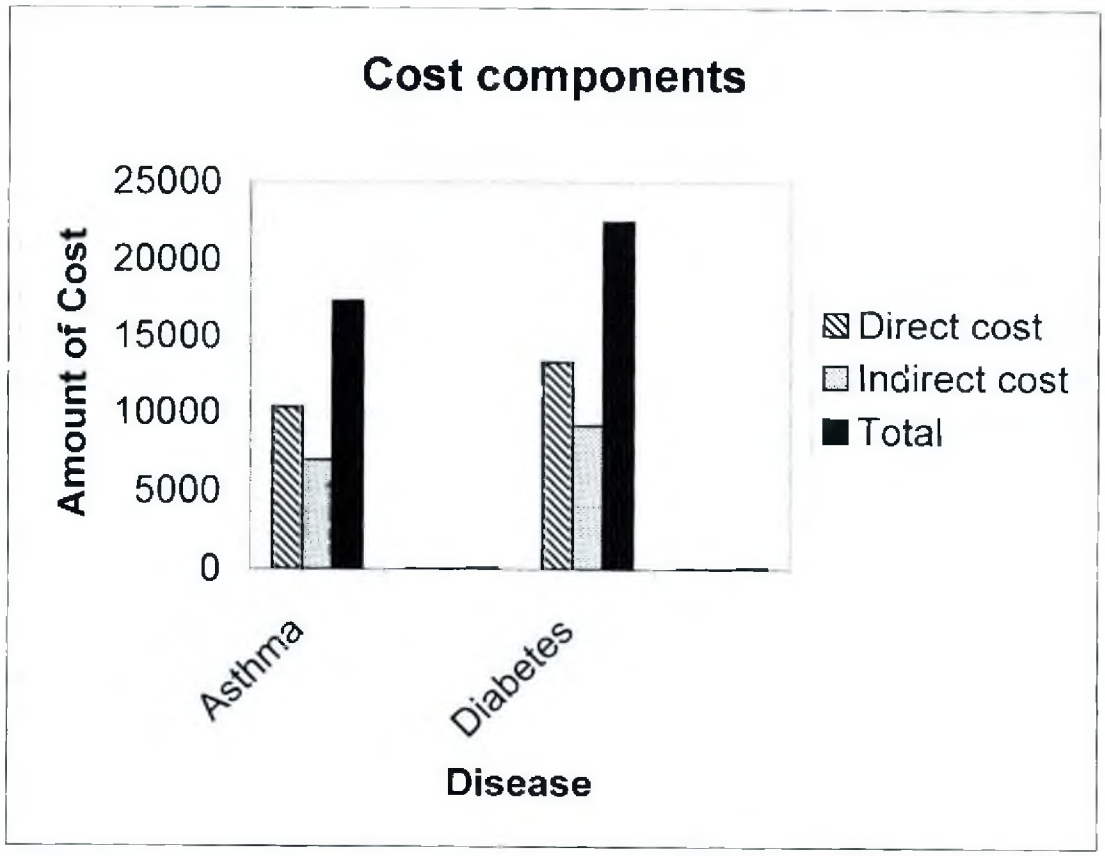


Figure 10: Cost components (Direct, Indirect & Total)

Cost analysis in 100 diabetes patients & 100 asthma patients showed that the total cost of treatment was US$ 17300.22 (direct cost US$ 10341.44 and indirect cost US$ 6958.78) with an average of US$ 173.00 per patient in case of asthma. On the other hand in case of diabetes the corresponding values are US $ 13308.28, 9159.49 and 22467.77 with an average 224.67. In direct cost we can find that the investigation and medical treatment constitute most of the cost both in asthma and diabetes. In case of drug, to treat diabetes it cost more higher than in case of asthma. The corresponding values are 957.66 and 1954.53 US$ which is almost double. Analyzing the indirect cost children deprivation; housewife service cost and waiting time lost constitute more lower cost in both the cases. Travel cost and productivity loss makes the most part of the indirect cost in both the cases.

Table 13: Cost components (maen±sd)

Disease	Total Cost (US $)	Direct Cost (US$)	Indirect Cost (US$)
Diabetes	224.67± 102.25	111.54 ± 81.39	52.2 ± 20.61
Asthma	173.00 ± 54.30	97.26± 52.91	38.41 ± 11.39
t/p value			
Diabetes/ Asthma	9.64/0.001	5.02/ 0.001	3.49/ 0.001

The incremental cost of intensive management of diabetes is US$ 101.54 (US$ 218.54 to US$ 117.00) per patient and event-free time gained in this group was 0.55 (0.18 to 0.92) years and the life year gain 1.19 (0.79 to 1.81) years. The incremental cost per event-free year gained was US$ 198.12 (costs and effects discounted at 6% a year) and US$ 201.34 (costs discounted at 6% a year and effects not discounted). The incremental cost of intensive management of asthma is US$ 89.54 (US$ 314.21 to US$ 224.67) per patient and event-free time gained in this group is 0.68 (0.21 to 0.89) years and the life year gain 1.12 (0.49 to 1.61) years. The incremental cost per event-free year gained was US$ 223.34 (costs and effects discounted at 6% a year) and US$ 234.25 (costs discounted at 6% a year and effects not discounted).

The main factors related to the perception of a health condition and a health status improvement (HSI) in the EuroQoL were morbidity 3.79 pain/ discomfort 3.34, anxiety/ depression 4.56, dependence for basic everyday living activities (usual activities) 4.19 and self care 2.78 for both the disease. The total for the asthma the health condition and a health status improvement (HSI) in the EuroQoL was 69.35 (per patient 2.41) where as for the diabetes the health condition and a health status improvement (HSI) in the EuroQoL is 136.39 (per patient 4.54). The EuroQoL difference between the disease was to be found 64.04.

Table 14: EuroQol (maen±sd)

Disease	**EuroQol**
Diabetes	4.54 ± .98
Asthma	2.37 ± .81
T/p Value	
Diabetes/ Asthma	-9.29/0.001

The cost-effective ratio is found to be (US$ 224.67/ 136.39) US$ 1.64 cost per effect in case of diabetes. The cost effectiveness ratio is (US$ 117.66/ 69.35) US$ 1.69 cost per effect in case of asthma. So management of diabetes is much more cost-effective.

It has been shown that the total cost increase due to increase a lot many factors. The direct items have an adverse affect on the total cost. Specially the indirect items are like to be increase and as a result the total cost increase accordingly.

Productivity loss (Pl)= f(income)= $2.12+2.29x_1$

Waiting time loss(Wl)= f(complication cost)= $1.92+2.63x_1$

Travel cost(Tc)= f(age)= $.42+1.17x_1$

4.3 Disease related complications and its trend of cost: A total of 100 DM patients and Asthma 100 patients were considered for an average of 365 days, totaling 651 person-yrs of observation. The total number of admissions generated 130 bed-days (17 individuals with diabetes) and 61 bed-days (9 individuals with asthma) total costs of US $ 188 (US $ 143.4 for individuals with diabetes and the rest for asthma). The mean cost per admission was US $ 8.43 for individuals with diabetes and US $ 4.95 for asthma. The rate of admissions during the study year was 17 per 1.00 individuals with diabetes compared with 9 admissions per 1.00 for individuals with asthma. Some of the clinical findings also found as interesting to support the hypothesis. As the management is always related to cost so, good management procedure always involve less cost than that of bad management procedure. The mean (± SD) age between the groups was 53.6±8.8 & 55.0±9.1 yrs, systolic

blood pressure was found 152.5 ± 20.9 mmHg & 123.5±11.9 mmHg, diastolic 97.7±10.0 & 78.7±9.3 mmHg, total cholesterol 195.5±41.6 & 109.2±34.5 mg/dl, HDL cholesterol 50.2±20.3 & 39.1±15.1 mg/dl, HbA_{1c} 7.1±1.5% & 4.9±1.9%, and Hb level 11.9±1.3 & 13.9±1.5 g/dl in case of asthma and diabetes respectively.

Nineteen patients were free of Asthma -related & complication comorbidities & 36 in Diabetes patients. In Asthma group, 32 patients had one complication and 29 had two & 20 had more than two complications & in diabetes group it was 48, 10 & 6 respectively. The more frequent complication was vasculopathy, which affected 32% DM patients, followed by cardiopathy 22%, retinopathy 16% & nephropathy 11%. Among the asthma patients on the other hand only 26% is suffering from Bronchiolitis, 19% from mild allergies and 12% from Whooping cough and 7% others. While in hospitalization, 52% (US$ 14360.48) of costs were attributable to drugs for these patients of both the diseases who have complications of which US$ 10419.39 was for asthma patients. 28% (US$ 7732.56%) to hospitalizations of which US$ 4913.72 was for Asthma. 11% (US $3037.79%) to diagnostics & US$ 1953.22 for Asthma and 9% (US$ 2485.46) to visits & US$ 1631.42 for Asthma. So the result showed that the initial cost is much more higher in case of diabetes than that of Asthma, but when goes for management of these two diseases then we could find that complication become less in case of diabetes. And management showed that when the diabetes could mange properly and care become fruitful then its much more cost-effective than that of Asthma.

The annual medical costs increased with the number of complications from US$ 1,320 to US$ 2,296 & to US$ 3,989 in Asthma with one, two & more than two complications which is increasing at a rapid speed and US$ 917 to US$ 1556 & to US$ 2372 in diabetes patients respectively, increasing at a diminishing marginal rate. The association showed statistically significant in both univariate ($P < 0.0001$) and multiple linear regression analyses ($R^2 = 0.51$; F-82.5, $P < 0.0001$).

4.4 Disability calculation:

The number and causes of working days lost during the calendar year were determined for each individual. For temporary disability, average days per year lost in asthma patients without complications did not differ significantly from the number for the age- and sex-matched control group ($p < 0.01$). However, diabetic patients with chronic complications had a considerably higher rate ($p < 0.06$) of days lost than the control group or patients with diabetes without complications. The costs of permanent disability for patients were estimated by calculating the expected number of years to retirement age for each early retiree. Work production loss was discounted at a 6 % rate (WHO Criteria). Average work production lost for 15 patients disabled by diabetes was 11 years (n = 15; 8 women, 7 men) and 9 patients disabled by diabetes was 5.8 years. At an annual cost of US $ 32,6,10 (U.S. dollars) for Asthma and the total cost for the diabetes was US $27,20,9 calculated due to DALY. So economic evaluation of management showed that Diabetes is much more cost effective when it treated properly than that of Asthma.

SUMMARY & CONCLUSIONS

5. SUMMARY AND CONCLUSIONS OF THE STUDY

5.1 SUMMARY: The patients with type 2 diabetes significantly increased treatment costs but substantially reduced the cost of complications and increased the event-free days but the rate is not diminishing marginal rate, it is an increasing rate. On the other hand the patients with acute asthma does not significantly increased the treatment costs and as well as the cost of complications and increased the event-free days, also the rate of increase is the diminishing marginal rate, its not a increasing rate at all like the diabetes one. Timely management of patients with diabetes is both clinically astute and cost effective. It can increase survival and the interval without complications, and the cost effectiveness ratio will be able to compare favorably among many accepted healthcare programmes. As compare to asthma patients the cost of care for diabetic patient is a bit higher than that of asthma. And timely management is more effective and worthwhile. This indicates that comprehensive care can reduce the burden of diabetes even in a developing country. Future studies could also cast further light on the non-hospital costs of diabetic complications.

CONCLUSIONS: These findings support the common notion of the local health workers that diabetes have become major economic and non-economic and public health problems among the subjects.

Inadequate awareness regarding the control of diabetes disease clearly indicate future directions to improve the health of those patients with type 2 diabetes and to undertake prevention programs that are culturally oriented, family centered, and community-based targeting healthful living.

RECOMMENDATIONS:

The study will provide macro-background for economic and clinical researchers to proceed further. Since there is no clinical and cost effectiveness analysis of the treatment of complications from Diabetes and Asthma, this will be a pilot and pioneer study in a poor

country like Bangladesh where out of pocket expense of patients and resource constraint of providers can be addressed.

5.1.1 DEVELOPING A STRATEGIC PLAN FOR DIABETES AND ASTHMA

Planning and Development Stages

Stage 1— Planning

Research and develop

Establishment of regular country wide inter-sectoral communication between key Diabetes and Asthma stakeholders.

Endorsement of the Strategic Plan for Diabetes and Asthma in Bangladesh.

Stage 2 — Development

The Strategic Plan for the Management of Diabetes and Asthma in Bangladesh will be based on the concepts within the National Diabetes and Asthma Strategy and will take advantage of the work already done at national level.

Review the status of Diabetes and Asthma in Bangladesh with reference to the goals and direction of the National Diabetes and Asthma Strategy, with particular reference to the Indicators, management of Diabetes and Asthma in young people and adolescents, consensus statement on the management of Diabetes and Asthma.

Establish regular inter-sectoral communication and collaboration between all agencies in Bangladesh involved in prevention, primary care and specialized care in Diabetes and Asthma. Other service providers within the health-care structure and consumers/consumer advocates to determine effective processes to address Strategic Planning Issues.

Develop a Strategic Plan for the Management of Diabetes and Asthma in Bangladesh in line with global initiatives in Diabetes and Asthma.

5.1.2 Strategic Planning Issues

The following issues have been identified as essential components in developing a Strategic Plan for the management of diabetes in Bangladesh. Diabetes and Asthma are

common, chronic disease that contributes significantly to mortality, morbidity, disability and health costs in Bangladesh. Both the incidence and prevalence of Diabetes and Asthma is rising and will continue to increase unless effective prevention strategies are implemented. Effective management of Diabetes and Asthma requires improvements in early detection of people with Diabetes and Asthma, further improvements in the quality of Diabetes and Asthma care including improved self-management approaches and prevention programs for Diabetes and Asthma -related complications, and improved patient data-management and recall systems.

5.1.3 Improving information

At present, information on the incidence, prevalence, and management of Diabetes and Asthma in Bangladesh, is dispersed in numerous data collections, including the Hospital Mortality and Morbidity Data System, and those data sets maintained by Health Services, accredited Diabetes Association, General Practitioners, private Allied Health practices, Centre for Population Health Research, and non-Government organizations which manages the National Diabetes Services Scheme.

Improvements in data collection are in progress with newly established national registers. Register will be collecting state-based incidence data for Diabetes and Asthma registers.

The Strategic Plan would facilitate and support the systematic development of Diabetes and Asthma data sets in Bangladesh, which would comply with a national Diabetes and Asthma monitoring system.

5.1.4 Implementing 'best practice'

Clinical best practice, as is being facilitated by the National Diabetes and Asthma Strategy, needs to be disseminated widely and all health service practitioners need to be aware of new developments. Clinical best practice includes establishing processes and mechanisms for the early detection of Diabetes and Asthma and establishing regular recall systems and assessment for early detection, monitoring and management of complications.

In the first instance nationally endorsed guidelines and consensus statements on Diabetes and Asthma would be considered for endorsement in Bangladesh.

The Strategic Plan would encourage a coordinated approach for achieving sustainable continuing education for health professionals in Diabetes and Asthma which together with nationally endorsed guidelines, consensus statements and codes of conduct, would lead towards implementing best practice in diabetes management and service delivery in Bangladesh.

5.1.5 Improving service integration across the continuum of care

The Strategic Plan would provide the structure and direction for achieving the coordination of primary prevention strategies for Diabetes and Asthma, and the coordination of diabetes services and management, across all levels of service intervention.

Diabetes and Asthma prevention and promotion strategies need to be developed in liaison with health promotion programs designed to address lifestyle risk factors common to and Asthma and other non-communicable chronic diseases particularly cardiovascular disease of which diabetes is itself a major risk factor. Such programs would include those conducted by Government and non-Government organizations.

In Bangladesh the care and management of people with Diabetes and Asthma is provided by general medical practitioners, specialist medical practitioners at major regional hospitals, multidisciplinary teams of specialist health professionals in accredited multi-disciplinary diabetes centres, health professionals at community health centres and private sector allied health practitioners. Over recent years organizational role delineation has gradually evolved and moved into being accepted practice. However there is no documented or consistent approach to the management of people with Diabetes and Asthma across the different health sectors in Bangladesh.

Similarly there is acknowledgement that service coordination could be improved within the acute care health sector by including Diabetes and Asthma as a mandatory field on a

hospital admission form. This would ensure that people with Diabetes and Asthma would have this pre-existing condition recognized and immediately taken into account in the management of the current condition for which hospitalization was required. This is yet to be implemented for in-patient management in acute care hospitals in Bangladesh.

5.1.6 Improving understanding

There is a tendency for the general population to believe they know a lot about Diabetes and Asthma and yet on testing, that knowledge is quite limited. Similarly the seriousness of Diabetes and Asthma is understated in the general population and also by people with Diabetes and Asthma. These attitudes are also held by health professionals not directly involved with Diabetes and Asthma.

In the long term there is a need for an attitudinal change towards all forms of Diabetes and Asthma both among health professionals and in the wider community, in order that Diabetes and Asthma are acknowledged for its seriousness but recognized as being a condition that can be effectively and efficiently managed by people with Diabetes and Asthma and their health service practitioners. To have Diabetes and Asthma are to have ongoing needs, which range well beyond the provision of clinical services. The condition is chronic, incurable and progressive. However effective and efficient management, including knowledgeable self-management can ameliorate the concomitant difficulties. Physical and psychosocial issues need to be given due attention in the health planning process. Ultimately this will lead not only to improved health outcomes across the population, but also to better quality of life for both the person with diabetes and the community.

The Strategic Plan would provide a lead and direction towards achieving comprehensive health outcomes for people with Diabetes and Asthma.

5.1.7 Improving consumer information, access and participation in decision making

Management of Diabetes and Asthma involves a substantial burden of responsibility on patients themselves as well as their families or other immediate caregivers. While the focus and scope of this involvement depends upon the patient's Diabetes and Asthma status, it is essential that the direction of Diabetes and Asthma management be on "informed self care".

People with or at risk of developing Diabetes and Asthma have the right to obtain accurate and timely information about their condition and to access services from a range of sources. The goal should be a partnership of coordinated knowledge-based decision-making between health service practitioners and the patient.

The Strategic Plan would provide direction towards achieving the recognition that for effective long-term management, patients, families, carers, and community need to be actively involved in service planning and delivery.

5.2 Levels of Intervention

The Strategic Plan for the Management of Diabetes and Asthma in Bangladesh would address Diabetes and Asthma services at three levels of intervention, which are not necessarily mutually exclusive, and consider service providers under the following categories.

5.3 Prevention - refers to primary prevention, which addresses risk factors such as obesity, inactivity, poor diet, and pre-diabetic conditions for diabetes and dam weather, cold and cough for asthma. At Government level the Division of Health the Community and Rural Health in the Department of Health & Human Services would have units addressing prevention of diabetes and risk factors for diabetes and asthma as well. Primary Care - refers to the care provided by general practitioners, community nurses, allied health professionals and aboriginal health workers as the first point of contact. Government level the Community and Rural Health would have the main responsibility for the delivery of

primary care services for people with diabetes and asthma. The major unit would be the Aged Care, Rural and Community Health unit and to a lesser extent the Palliative Care and the Disability units. Non-government organizations involved in Primary Care would be Diabetes and Asthma in Bangladesh. Specialized Care - refers to any services which are outside the scope of the primary care providers, and may include acute hospital care, specialist medical attention, and multi-disciplinary expertise provided through nationally accredited. Government level the Division of Hospitals and Ambulance would have the main responsibility for specialized care. Specialist medical practitioners in private practice would be the main non-government service providers in this category.

5.3.3 Service providers

Primary health care providers include general practitioners, community nurses and nurse educators. Primary health care is recognized as pivotal in the coordination and delivery of diabetes services. Allied Health Professionals delivering services typically include dietitians, podiatrists, clinical psychologists, pharmacists and optometrists, and may also include physiotherapists and social workers. Specialist medical health care providers delivering services include physicians, endocrinologists, renal physicians, cardiologists, neurologists, ophthalmologists, gerontologists and vascular surgeons.

5.4 Recommendation for management: asthma and diabetes

There are separate arrangements for programmes of care for patients with asthma and diabetes. Practices are paid for running and managing the programme, rather than for the care of individual patients. Separate payments can be claimed for asthma or for diabetes care or both, and the payments are fixed sums that do not vary with list size.

Programmes must include the following elements:

- register ,
- call and recall
- education of newly diagnosed patients
- continuing education
- individual management plans

• regular view
• teamwork - appropriate links with appropriately trained professionals
• referral policies
• record keeping
• audit

5.4.1 Management: asthma care

• maintain a register of all asthma patients
• ensure that systematic call and recall of patients on the register is taking place, in either hospital or GP setting
• give advice to newly diagnosed patients or their carers
• ensure all asthma patients (or their carers) receive continuing education, including supervising inhaler technique
• prepare with the patient an individual management plan
• regularly review the patients (including peak flow measurements), generally every six months, but more or less frequently as required
• ensure any health professionals involved in the care of asthma patients are appropriately trained
• refer patients to other services as required
• maintain adequate records and audit the care programme

5.4.2 Management: diabetes care

• maintain a register of all diabetic patients
• ensure that systematic call and recall of patients on the register is taking place, in either hospital or GP setting
• give advice to newly diagnosed patients or their carers
• ensure all diabetic patients (or their carers) receive continuing education
• prepare with the patient an individual management plan

• ensure that on initial diagnosis and at least annually, a full review of the patient's health is carried out, including checks for potential complications and a review of the patient's own monitoring records

• work together with other professionals (e.g. dieticians) where appropriate

• ensure any health professionals involved in the care of diabetic patients are appropriately trained

• refer patients to other services and supportive agencies as required, using locally agreed referral guidelines where these exist

• maintain adequate records and audit the care programme

5.5 LIMITATIONS OF THE STUDY

The sample size in this Study is too small to conclude regarding the relevant issue.

Some ethical issues are also involved. All of our samples are not uniformly investigated due to various reasons. Our patients might not afford many costly investigations and we also do not find it justified that to serve the academic interest patient should spend more money.

All cases might not be possible to be followed-up at regular intervals. Some patients might not be available on follow-up.

Survival analyses will not be possible to perform.

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APPENDIX

Economic Evaluation of Management of Diabetes and Asthma: A study of selected patients in Bangladesh

Appendix 1

1. ID No **2.** Name **3.** Age **4.** Sex

5. Height **6.** Weight

7. Family member:

8. Education: Illiterate/ primary/ secondary/ graduation/ above/ technical/ expert

9. Occupation: Day Laborer/ Official worker/ Defense person/ Businessman/ Student/ House wife/ Others

10. Monthly Income

11. History of DM:

- Date of diagnosis & Duration
- BP record along with medication history

Date	BP	Prescribed Medicine

12. Presenting symptoms: Date & Duration

Palpitation	Headache	Perspiration
Chest pain	Vertigo	Restlessness
Compression	Visual disturbance	Dyspnoea
Nausea/vomiting	S/S of TIA	

13. History of blood glucose

-Duration

- BG record along with medication history

Date	BG	Prescribed Medicine

14. Investigation Performed

	Date	**Findings**

Lipid profile

TG	S Chol	LDL	HDL
S Creatinine	S Urea	Microalbumine	ACR
Plain x-ray:	CT Scan	MRI	Others

15. History of any Operation (Name, Date & findings)

16. Physician's comment on HTN management procedure

Scoring: 2/3/4/5

(Excellent-5; Good-4; Satisfactory-3; Bad-2)

17. Outcome: Scoring: 2/3/4/5

(Excellent-5; Good-4; Satisfactory-3; Bad-2) Status: Improved /Deteriorated

18. Complications HTN/ IHD/ Cardiac arrythmia/ Heart failure/ Stroke/ Heart block

19. Associated Medical conditions

DM, Cancer, STI, Retinopathy, Neuropathy, Nephropathy, Foot Ulcer

20. Follow–up period in months:

Appendix 2

EuroQoL Classification System

Mobility

1. No problem in walking
2. Some problem in walking about
3. Confined to bed

Self-care

1. No problems with self-care
2. Some problems with washing or dressing itself
3. Unable to wash or dress self

Usual activities

1. No problems with performing usual activities
2. Some problems with performing usual activities
3. Unable to perform usual activities

Pain/discomfort

1. No pain/discomfort
2. Moderate pain/discomfort
3. Extreme pain/discomfort

Anxiety/depression

1. Not anxious/depressed
2. Moderately anxious/depressed
3. Extremely anxious/depressed

Appendix 3

Direct cost from consumer's point of view

Other source of income:

Where from coming:

Transport cost: For arriving in Dhaka For arriving in Hospital

Cost of food:

Total time spent: Total working hours lost Total amount of wage lost

Cost of Investigations and treatment received:

Name of Invest	Cost of Invest	Name of Treatment & Drug used	Cost of Treatment & drug used	Duration of Treatment	Total cost

Cost of Investigations and treatment of complications

Name of Invest	Cost of Invest	Name of Treatment & Drug used	Cost of Treatment & drug used	Duration of Treatment	Total cost

In-Patient Event (If any)

Free/paying bed/paying cabin

Cost of hospital stay Length of stay

Cost of food

Total time spent: Total working hours lost Total amount of wage lost

Expenditure of accompanying person

Transport cost: Accommodation cost: Cost of food:

Total time spent: Total working hours lost Total amount of wage lost

Others

Appendix 4

Indirect Cost:

What is your present monthly income

Is this the income before: Yes/ no

If no, what was your previous income

Do you need to sell your property or household good for the treatment of the disease: Yes/no

If yes, please specify

Do you need to change your profession: Yes/no

If yes, please specify

Do you need to change your working hour: Yes/no

If yes, please specify

For the treatment of this disease, is there any influence on your saving? Yes/ no

If yes, please specify

Have you employed any person who takes care of you? Yes/ no

If yes, do you pay him/ her? Yes/ no

If yes, how much

If no, how did your disease affected his/ her daily life

a) has to leave / change occupation

b) need to change her working hour (.....hour)

c) others

While undergoing the treatment

Is there any influence on the education of your children? Yes/ no

If the answer is yes, what kind

a) The education is totally stopped

b) There is inconvenience in buying books and paying dues

c) Study to private tutors has been stopped

d) The children have to off for alternative income

e) Others

Appendix 5

For YLD

Date of onset of disease

Date of onset of complication

1 2 3

Years of life lived with disability calculated in years

History of acute illness episodes (MI, HONK diabetic coma, lactic acidosis hypoglycemia)

Average duration of acute illness episodes

For YLL

Registration No

Age at death

Years lost due to premature mortality

Any complication or disability present

Years lived with disability

Appendix 6

Hospital's Case Record Form: Any interesting findings

Economic Evaluation of Management of Diabetes and Asthma: A study of selected patients in Bangladesh

Appendix 1

1. ID No **2.** Name **3.** Age **4.** Sex **5.** Height **6.** Weight

7. Family member: **8.** Education: illiterate/ primary/ secondary/ graduation/ above/ technical/ expert

9. Occupation

Day Laborer/ Official worker/ Defense person/ Businessman/ Student/ House wife/ Others

10. Monthly Income

11. History of DM:

- Date of diagnosis & Duration
- BP record along with medication history

Date	BP	Prescribed Medicine

12. Presenting symptoms: Date & Duration

Bronchiolitis	Mold allergies	Whooping Cough
Palpitation	Headache	Perspiration
Chest pain	Vertigo	Restlessness
Compression	Visual disturbance	Dyspnoea
Nausea/vomiting	S/S of TIA	

13. History of blood glucose

-Duration

- record along with medication history

Date	Report of severity	Prescribed Medicine

14. Investigation Performed

	Date	**Findings**	
Lipid profile	TG	S Chol	LDL
HDL	S Creatinine	S Urea	Microalbumine

ACR Plain x-ray CT Scan MRI

Others

15. History of any Operation (Name, Date & findings)

16. Physician's comment on Asthma management procedure

Scoring: 2/3/4/5 (Excellent-5; Good-4; Satisfactory-3; Bad-2)

17. Outcome: Scoring: 2/3/4/5

(Excellent-5; Good-4; Satisfactory-3; Bad-2) Status: Improved /Deteriorated

18. Complications HTN/ IHD/ Cardiac arrythmia/ Heart failure/ Stroke/ Heart block

19. Associated Medical conditions

DM, Cancer, STI, Retinopathy, Neuropathy, Nephropathy, Foot Ulcer

20. Follow–up period in months:

Appendix 2 EuroQoL Classification System

Mobility

No problem in walking

Some problem in walking about

Confined to bed

Self-care

No problems with self-care

Some problems with washing or dressing itself

Unable to wash or dress self

Usual activities

No problems with performing usual activities

Some problems with performing usual activities

Unable to perform usual activities

Pain/discomfort

No pain/discomfort

Moderate pain/discomfort

Extreme pain/discomfort

Anxiety/depression

Not anxious/depressed

Moderately anxious/depressed

Extremely anxious/depressed

Appendix 3

Direct cost from consumer's point of view

Other source of income:

Where from coming:

Transport cost: For arriving in Dhaka For arriving in Hospital

Cost of food:

Total time spent: Total working hours lost Total amount of wage lost

Cost of invasive procedure

Cost of Investigations and treatment received:

Name of Invest	**Cost of Invest**	**Name of Treatment & Drug used**	**Cost of Treatment & drug used**	**Duration of Treatment**	**Total cost**

Cost of Investigations and treatment of complications

Name of Invest	**Cost of Invest**	**Name of Treatment & Drug used**	**Cost of Treatment & drug used**	**Duration of Treatment**	**Total cost**

In-Patient Event (If any)

Free/paying bed/paying cabin

Cost of hospital stay Length of stay

Cost of food

Total time spent: Total working hours lost Total amount of wage lost

Expenditure of accompanying person

Transport cost: Accommodation cost: Cost of food:

Total time spent: Total working hours lost Total amount of wage lost

Others

Appendix 4

Indirect Cost:

What is your present monthly income

Is this the income before: Yes/ no

If no, what was your previous income

Do you need to sell your property or household good for the treatment of the disease: Yes/no

If yes, please specify

Do you need to change your profession: Yes/no

If yes, please specify

Do you need to change your working hour: Yes/no

If yes, please specify

For the treatment of this disease, is there any influence on your saving? Yes/ no

If yes, please specify

Have you employed any person who takes care of you? Yes/ no

If yes, do you pay him/ her? Yes/ no

If yes, how much

If no, how did your disease affected his/ her daily life

has to leave / change occupation

need to change her working hour (.....hour)

others

While undergoing the treatment

Is there any influence on the education of your children? Yes/ no

If the answer is yes, what kind

The education is totally stopped

There is inconvenience in buying books and paying dues

Study to private tutors has been stopped

The children have to off for alternative income

Others

Appendix 5

For YLD

Date of onset of disease

Date of onset of complication

1 2 3

Years of life lived with disability calculated in years

History of acute illness episodes (MI, HONK diabetic coma, lactic acidosis hypoglycemia)

Average duration of acute illness episodes

For YLL

Registration No

Age at death

Years lost due to premature mortality

Any complication or disability present

Years lived with disability

Appendix 6

Hospital's Case Record Form: Any interesting findings

DISEASE:	***Diabetes And Asthma***	***Updated:***	***10.01.07***
REGION:	Bangladesh	By:	Samira
PERIOD:	2004	Status:	Final

THIS TEMPLATE ENABLES CALCULATION OF YLL (See Part A below in rows 25 to 102)

YLD (See Part B below in rows 105 to133)
DALYs (See Part C below in rows136 to 150)

IF YOU HAVE MORE THAN ONE SEQUELA FOR A DISEASE, CREATE A COPY OF THIS TEMPLATE
FOR EACH SEQUELA AND ADD THE DALYs FOR ALL SEQUELAE.

1. Enter disease name, region and period in the yellow cells above.
2. Enter update information in the purple cells above right.
3. If required, change discount and age weight parameters for DALY calculation in the gray box below.
4. If required, change age groups (insert additional rows if needed, and adjust lookup formulae for standard LE)

0.03 Discount rate (r)	***Standard discount rate is 0.03***
0.04 Beta (b)	Standard age weights use beta=0.04
0.1658 Constant (C)	Standard age weights use C=0.1658
-0.07 -(b+r)	
0 K	K=0 (no age weights) to 1 (full age weights)

A. YLL template

A1.Enter population data in yellow cells below.
A2. Enter numbers of deaths for 5 year age groups in green cells below. (or death rates in next column and calculate numbers of deaths)
A3. If necessary, modify average ages at death (blue column).
This may be important for lowest and highest age groups.

	Population	*Deaths*	*Deaths* per 1,000	*Av. Age* at death	*Standard* LE		*YLLs*	*YLL per* 1,000
Diabetes								
30- 65	100	3	30.00	32.6	54.8	1.000	81	807.0
Total	100	9	90.00	10.9	18.3		81	807.0

Asthma								
30-65 onwards	100	3	30.00	32.6	50.7	1.000	78	781.4
Total	100	3	0	32.6	50.7		78	781.4

A1. YLL in study age groups

	Population	Deaths	Deaths per 1,000	Av. Age at death	YLLs	YLL per 1,000
Males						
30-65	100	3	30.0	32.6	81	807.0
Total	100	3	30.0	10.9	81	807.0
Females						
30-65	100	3	30.0	32.6	78	781.4
Total	100	3	30.0	32.6	78	781.4

B. YLD template

B1. Enter population data in yellow cells below (if have not entered them above for YLL).

B2. Enter incidence rates, age at onset and duration in green cells

B3. Enter disability weights in blue cells below.

	Population	*Incidence*	*Incidence* per 1,000	*Age at* onset	*Duration* (years)	*Disability* Weight	*YLDs*	*YLD per* 1,000
Males								
30-65	100	5	0	37.5	0.0	0.500	-	0.0
Total	100	5	52.0	37.5	0.0	0.50	-	0.0
Females								
30-65	100	8	0	37.5	0.0	0.500	0	0.1
Total	100	8	82.0	37.5	0.0	0.50	0	0.1

C. Total DALYS = YLL+YLD

	Diabetes Population	DALYs	DALYs per 1,000	Asthma Population	DALYs	DALYs per 1,000	Persons Population	DALYs	DALYs per 1,000
Age									
30-65	100	81	807.0	100	78	781.6	200	159	794.3
Total	100	81	807.0	100	78	781.6	200	159	794.3